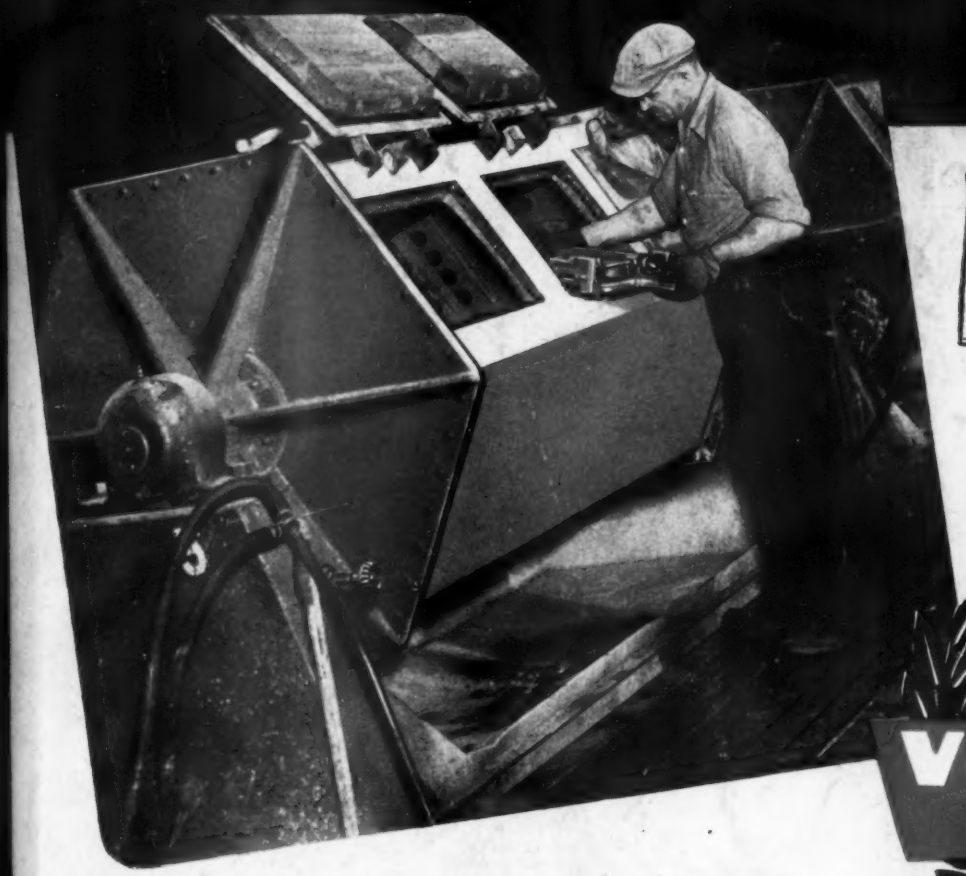
OCTOBER 25, 1945

TECHNOLOGY DEPT.

American Machinist



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American Machinist Chips

Them Was the Days . . . A friend recently sent us a really old-time document of the Metal-Working Industry. It is a contract for machine tools between the Algoma Central & Hudson Bay Railway Co. and Niles-Bement-Pond Co., Chicago. The date, September, 1912.

It must have been quite a handsome job for those days, complete with hand-colored pictures of the machine tools involved in the sale. Quite a contrast, the tools, with today's streamlined manufacturing units.

Winners . . . The weekly publication *Financial World*, investment business paper, recently announced the winners in their fifth yearly survey to determine the best annual stockholder reports in various industries. In the field of machines and tools, the report of Chain Belt Co. was judged best, with Buffalo Bolt Co. the runner-up. Congratulations to these companies, who are among the leaders in turning the one-time dry type of year-end statement into an interesting and informative piece of literature.

In This Issue . . . With a fanfare of trumpets and a barber shop rendering of "Hail, Hail the Gang's All Here," *American Machinist* returns in this number two long-time favorites for your enjoyment and aid . . . "Foreman's Round Table" and "Talking Shop." These down-to-earth discussions, occasionally salted with what we hope will be humor, will present a variety of topics involving the Metal-Working Industry and day-by-day shop problems facing production men.

Tests and results of barrel burnishing parts made of hardened steel, soft steel, bronze, aluminum and magnesium castings and die-castings are discussed in an article based on experience of the Plymouth Division of the Chrysler Corp. Granite chips are used in the open-end barrels. The rotating barrel method replaces time-consuming hand methods of deburring and polishing. Tests were made on castings for the Bofors gun.

In the first of a series of articles on the subject, Dr. C. R. Austin of the Meehanite Metal Corp. points out how heat-treatment imparts desired properties to high-strength irons. Laboratory test data serves as a yardstick for predicting the properties obtainable in the shop if allowances are made for greater mass of the casting.

Rarin' to Go . . . As a result of the inventive, scientific, industrial and engineering advances resulting from work on the atomic power project, it is estimated that more than 5,000 new and improved products and procedures are now available to American industry . . . awaiting only government release for volume production.

A few of these developments of interest to Metal-Working are improved pumps, improved automatic control, checking of welds, new valve, lubricant and packing methods and new treatment of metal surfaces to prevent corrosion.

Super Scoop . . . The government released in September the first progress report on the disposal of government plants.

Just as a matter of record, *American Machinist* carried in its January 4, 1945 issue—over 10 months ago—a Reconversion Section telling the R. F. C. plans for the sale of government plants. This section gave a great many of the facts and figures revealed in the September release.

Here again, if we may modestly say so, is an example of the type of inside contact and first-in-print reporting through which *American Machinist* is able to bring you advance tidings of important things to come in the industry.

It's the perfect plastic at last. It can be bored, punched, stamped, sawed, and in an emergency eaten with a light sauce."

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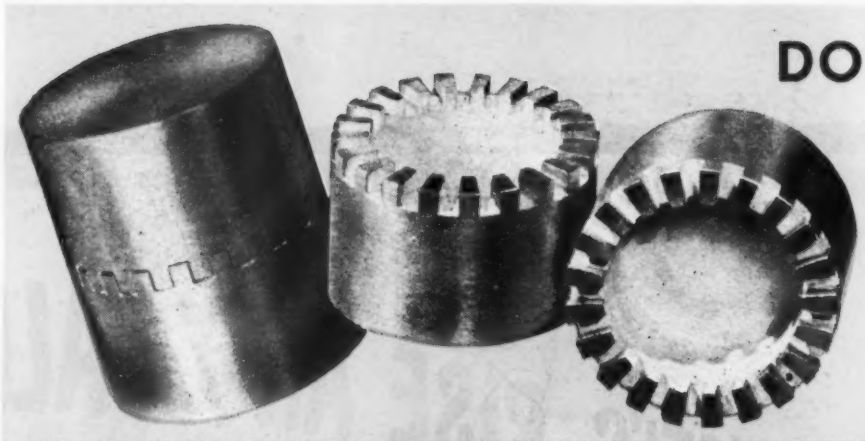


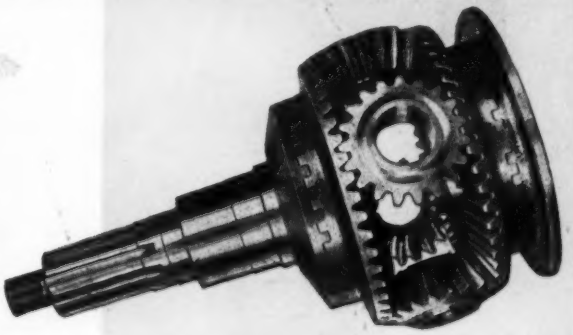
DO YOU NEED A PRECISION CONNECTION FOR COUPLED PARTS?

USE GLEASON CURVIC* COUPLINGS

A precision connection of a new type is now available for coupling together a wide variety of parts. These couplings have teeth of radial direction and parallel depth, cut and ground into the faces of the connected parts.

Gleason Curvic Couplings bring to the field of coupled parts the same high degree of accuracy, load capacity, and fast rate of production obtained in curved-tooth bevel gears, because the same Gleason cutting and grinding machines are used for both.

The Curvic design provides a precision, light, compact, and self-contained connection in which the teeth both center and drive. The accuracy and uniformity are such that complete interchangeability is possible, facilitating manufacture and assembly of the coupled parts.



GLEASON CURVIC COUPLINGS of the semi-universal type allow a slight angular mis-alignment of shafts (2° maximum) together with axial freedom. Used here to connect a planetary Zerol bevel reduction unit to a marine engine and transmission.

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Builders of BEVEL GEAR MACHINERY FOR OVER EIGHTY YEARS

Investigate the advantages of Gleason Curvic Couplings for your clutch and coupling applications. Write for descriptive brochure.

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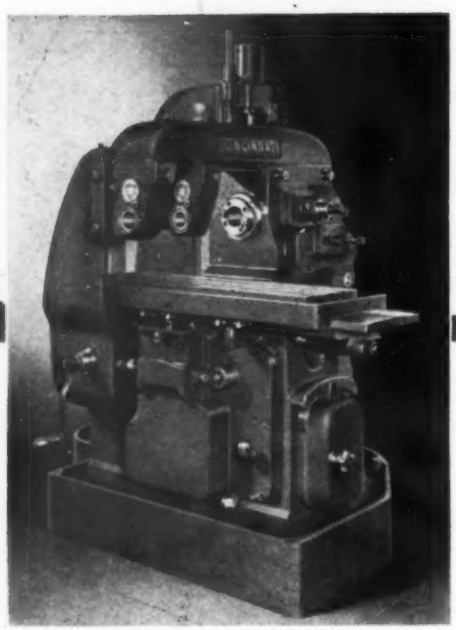
WITH CINCINNATI'S RISE AND FALL

THESE FRAGILE PARTS ARE MILLED CONTINUOUSLY AND FINISH IS UNMARKED



CINCINNATI *2-24 Automatic Rise and Fall Miller. Complete specifications may be obtained by writing for Catalog M-909-1. Sweet's Catalog File for Mechanical Industries gives a brief description of the machine.*

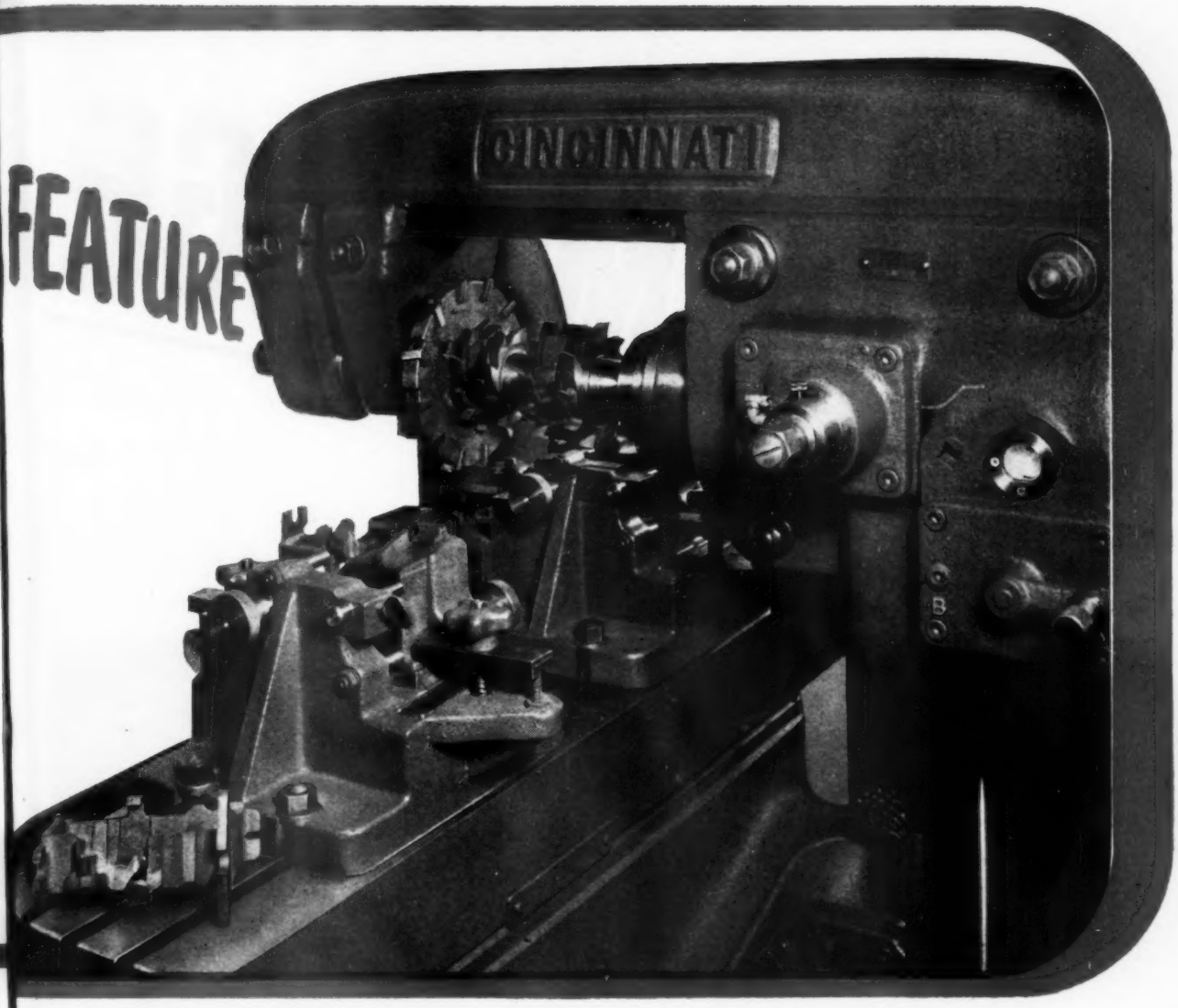
Milling only one surface of a fragile part without chatter and resultant bad finish, is a difficult accomplishment in itself, but the machine illustrated here mills *several* surfaces of fragile cast iron frames to a good finish with close tolerances of accuracy and minimum expenditure for equipment. ¶ The machine is a CINCINNATI No. 2-24 Automatic Rise and Fall Miller equipped with raised headstock, two fixtures and a special gang of cutters. The Rise and Fall feature provides two important advantages on jobs of this type: (1) prevents marred finish on return stroke; (2) permits increased freedom to design more effective work holding fixtures since cutters can hurdle obstacles in the fixture. ¶ The know-how of Cincinnati Application Engineers is manifest in the design of fixtures and cutters to mill many surfaces on a fragile part, and at the same time keep it from springing. If you have a similar problem, our engineers will be glad to recommend a productive, economical solution.

CINCINNATI

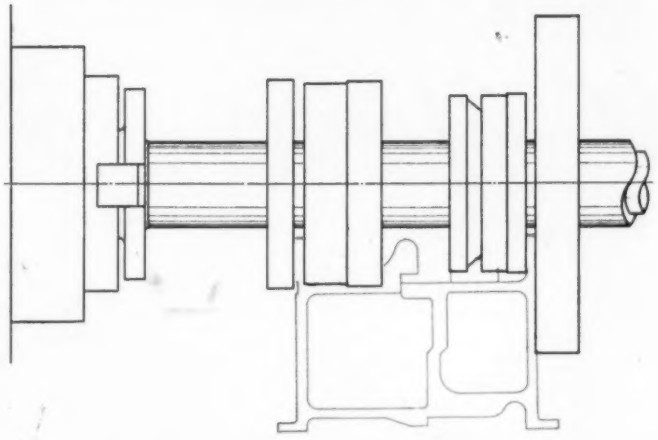
THE CINCINNATI

MILLING MACHINES

FEATURE



The illustration above shows the multiple cutter arrangement and the two fixtures which facilitate loading and unloading to make cutting virtually continuous. The machine used for the operation is a CINCINNATI *2-24 Automatic Rise and Fall Miller.*



Sketch shows the surfaces milled.
Name of Part: Frame
Material: Cast Iron
Operation: Gang mill several surfaces opposite feet
Production: 37 per hour

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

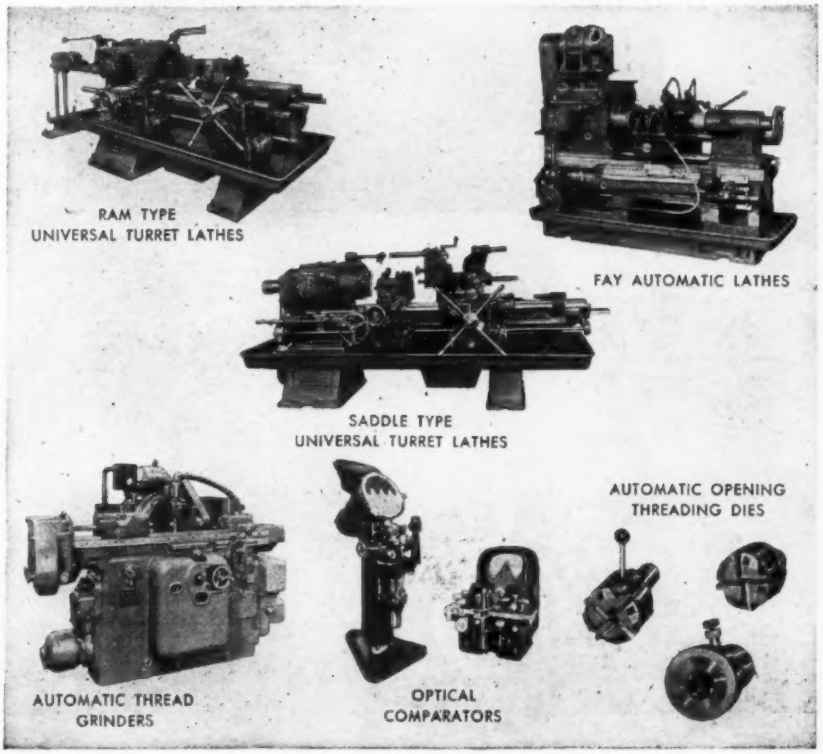
BROACHING MACHINES • CUTTER SHARPENING MACHINES

WANTA MANAGE

A CHAMP?

With postwar competition getting set for a slugging match, every machine you use will have to compete in the battle of costs on the basis of maximum production per man hour.

Now is the time to get rid of your "punch drunk" machines. Replace them with machines that can transmit the *horsepower and have the rigidity to take full advantage of carbide cutting tools—increase cutting speeds from 200 to 500 per cent.* Jones & Lamson has pioneered in machines designed specifically for the use of carbide cutting tools. Whether you buy War Surplus machines or new machines, send for our book "Welcome to You and Your Problem". Or, better yet, phone now for one of our engineers to assist you in making the most profitable investment.



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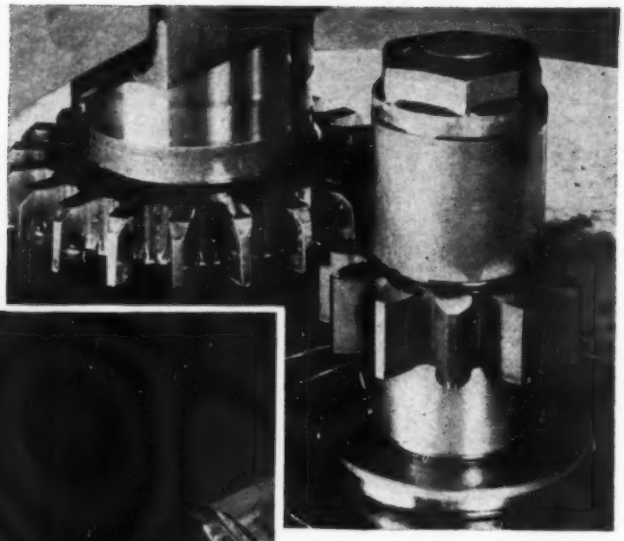
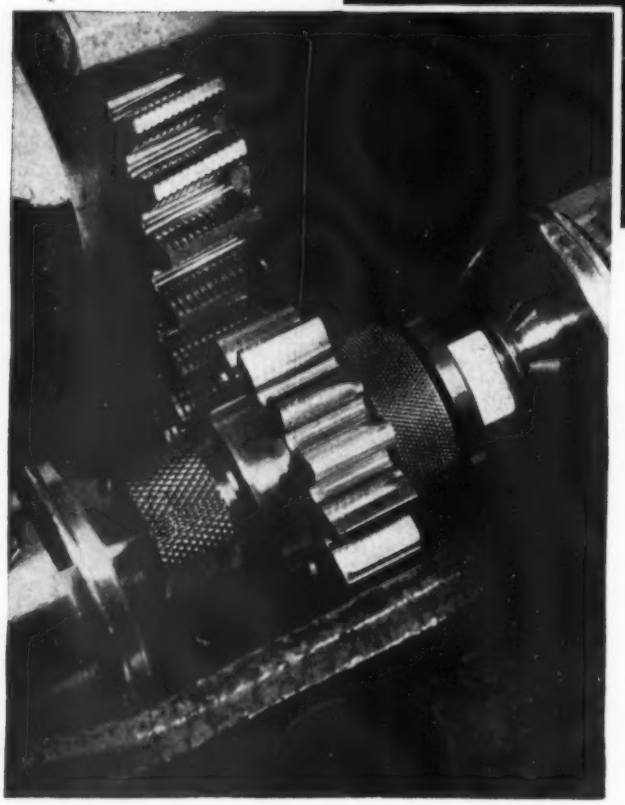
GEAR FINISHING





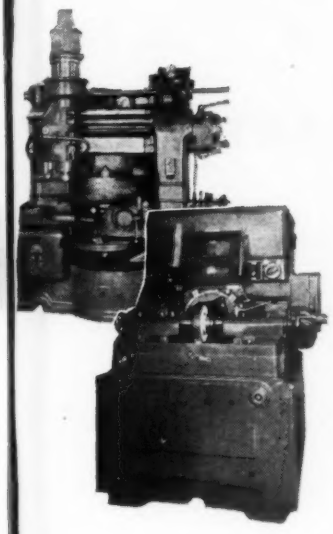
• 1. Pre-Shaving on a Fellows Gear Shaper

• 2. Shaving on a Fellows Gear Shaving Machine

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

OPERATIONS

in Balance



for Maximum Economy

Pre-shave on the Fellows Gear Shaper . . . then for final finishing use the Fellows Gear Shaving Machine.

The result: a degree of accuracy and economy in gear production that cannot be equalled by any other method.

For example, take the pump gear of a hydraulic mechanism produced for the Navy by The McIntyre Co. (formerly Zenith Associates) of Newton, Massachusetts.

This gear is made of copper-ferrite, is of 5 diametral pitch, 25° pressure angle, 12 teeth.

This gear is preshaved on a 6A-type Fellows Gear Shaper to a runout limit of .0008". It is then shaved on a No. 12 Fellows Gear Shaving Machine to a limit of .001 over pins on a diameter, with a runout limit of .0004" and a backlash limit of .0005" to .001".

Results such as this are obtainable with maximum overall savings only when you keep in view the fact that high accuracy pre-shaving of gears is as important as final shaving.

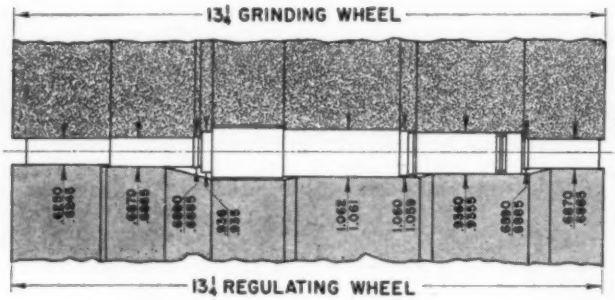
If you have gear problems feel free to call upon us. Our engineers will be glad to work with yours, and advise how the Fellows Method can be applied to your requirements. The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

The Problem:

GRIND 9 DIFFERENT DIAMETERS ON A LONG NARROW PART



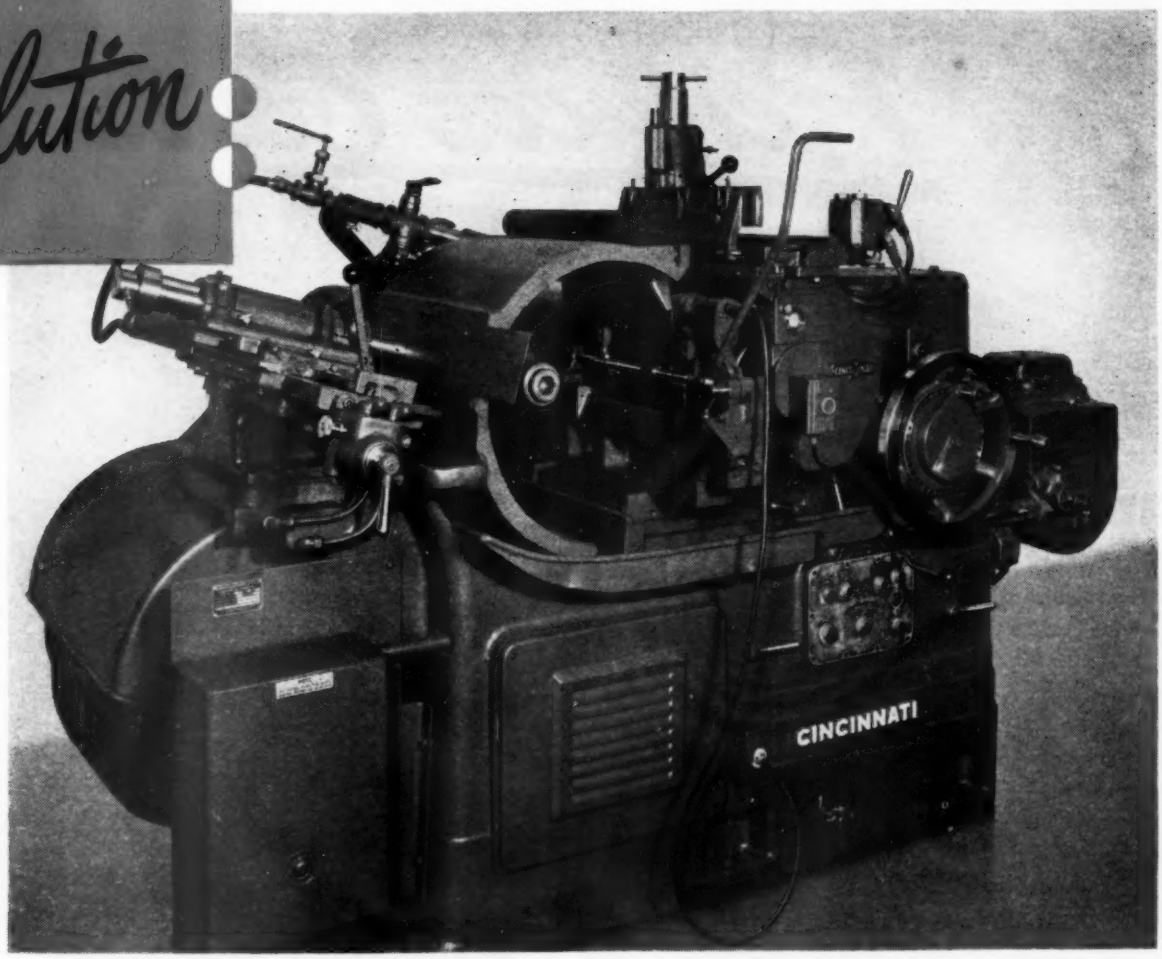
Sketch shows the part between the grinding and regulating wheels, and dimensions of each of nine diameters. Production is 45 pieces per hour.

These long, slender armature shafts, ground on the CINCINNATI Centerless at the right, actually presented two problems. First, the parts are approximately 13″ long and comparatively slender. Second, there are *nine* concentric diameters. The logical solution was to centerless grind the complete length of the part in one setting by the infeed method, for then there could be no doubt about accuracy and concentricity. The part is too long for a standard centerless grinder, so a CINCINNATI No. 3 size machine was equipped especially to handle the job. Equipment consisted of Profile Truing Attachments over grinding and regulating wheels, special wheel mounts to accommodate 13¼″ wide grinding and regulating wheels, a special wide work rest, magnetic work loading fixture, and Automatic Infeed Attachment. ¶ Selection of correct production methods for all sizes and shapes of parts is a habit with Cincinnati Application Engineers. Why not bring your difficult grinding problems to this group of engineers for efficient, economical solution?

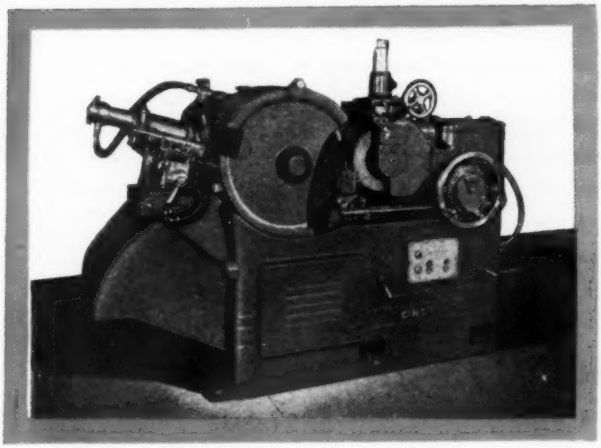
CINCINNATI

CENTER TYPE GRINDING MACHINES

The Solution



This illustration, taken with grinding wheel removed, shows the entire setup for grinding nine different diameters on a long, slender part. The machine is a CINCINNATI *No. 3 Centerless.*



CINCINNATI *No. 3 Centerless Grinding Machine. Complete specifications may be obtained by writing for Catalog G-438-3. For a brief description of this machine, look in Sweet's Catalog File for Mechanical Industries.*

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

An Investment that Reduces Costs

VAN NORMAN
Ram-Type Millers

No matter what your milling requirements . . . horizontal, angular, vertical . . . you can do the job on a *single* Van Norman Ram Type miller. How—simply swivel the adjustable cutterhead to the desired cutting position and you're ready for the operation.

The versatility of ram type millers to perform the work of many single-purpose machines pays off dividends by cutting idle machine and operator time as much as 50% because there is no waiting for specific machines . . . no continual changing of the workpiece. And in those plants where milling operations change from period to period, Van Norman Ram Type millers change to meet the work by swiveling the adjustable cutterhead. All horizontal, angular or vertical . . . some horizontal, some vertical, etc.—those are the combinations you can have with Van Norman Ram Types.

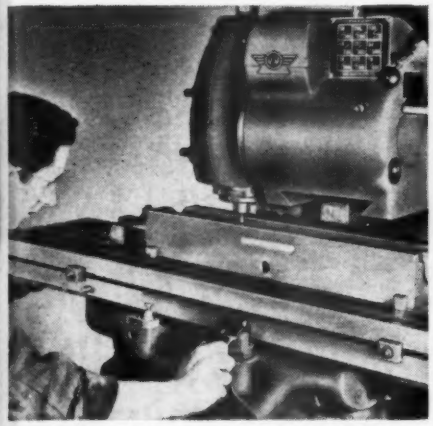
For ease of operation and accuracy of work, Van Norman gives you front and rear control of all power and manual feeds, single-lever feed selector, finger-tip directional control of power feeds, large easy-to-read dials, movable ram . . . each and every feature points to increased production, lower milling costs, wide application of use.

Find out how you can profit with Van Norman Ram Type millers. Write for information, today. They are available in 8 standard models with plain or swiveling tables.

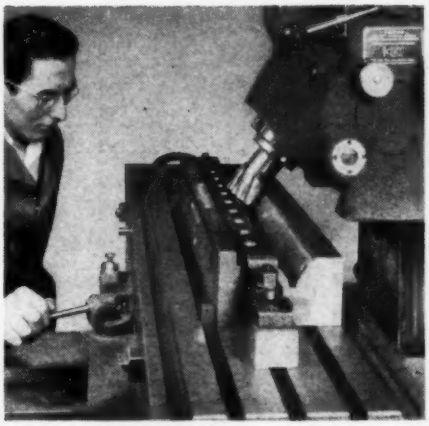
VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

"It Pays to Van Normanize"

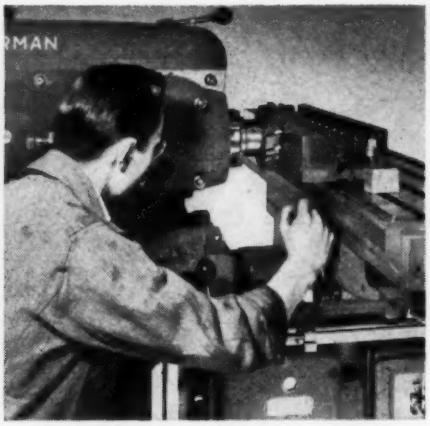
Cuts work reset-ups...improves accuracy



VERTICAL MILLING—With the adjustable cutterhead locked vertical and the workpiece positioned, the operator, using the front controls, starts the operation by milling a recess in the work.

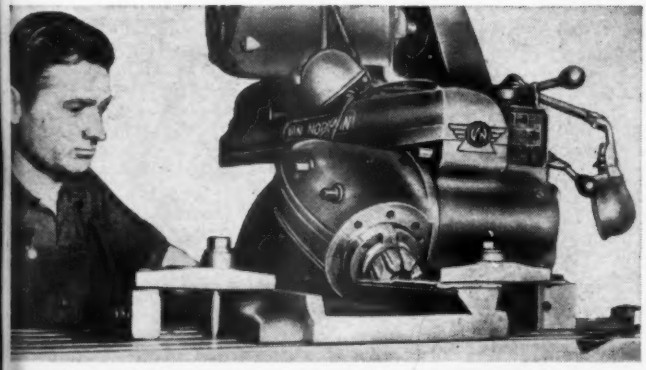


ANGULAR MILLING—Here a "V" is being milled. Note that only the position of the cutterhead has been changed, the workpiece is still in the original position.

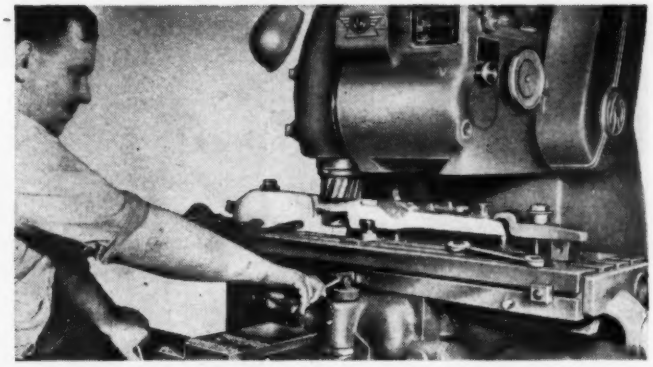


HORIZONTAL MILLING—Using the rear controls the operator completes the job with a face milling operation. One work set-up and simple changes in the versatile cutterhead complete most jobs.

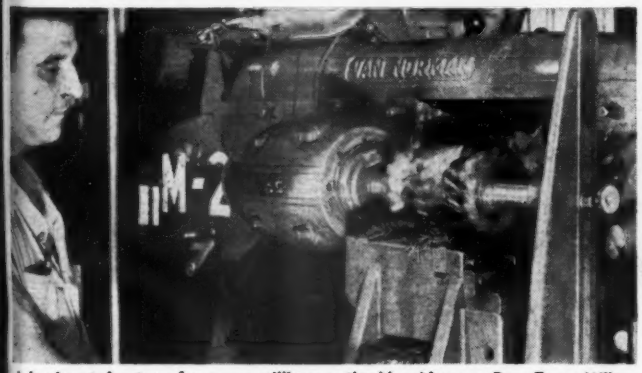
Eliminates idle machine time...increases production



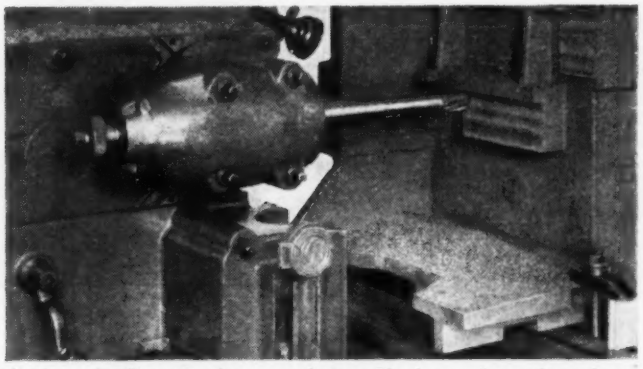
With the head locked in an angular position, the operator is taking an angular cut operating the miller with rear *directional* controls.



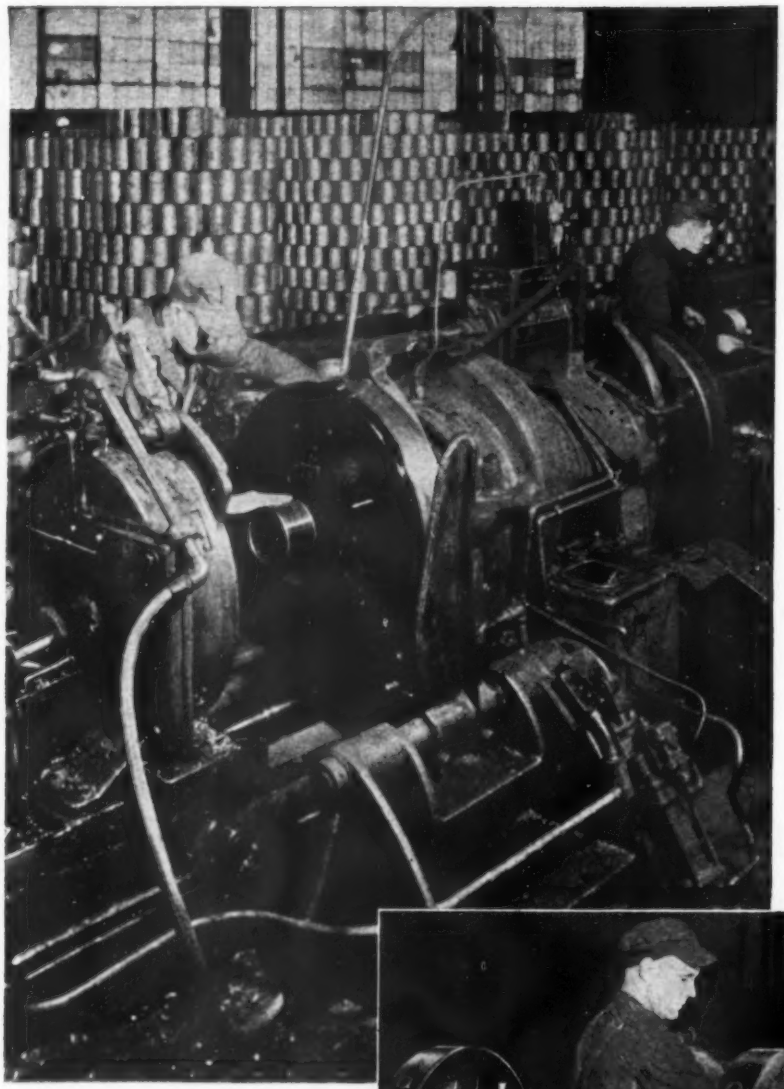
The Ram Type Miller used with the adjustable cutterhead in vertical milling position and operator using front *directional* controls.



A horizontal set-up for gang milling on the Van Norman Ram Type Miller. The ram type overarm with dovetail ways and arbor support assure rigidity and accuracy.



Horizontal milling of a heavy workpiece. The heavy-duty column, knee, saddle and table assemblies assure accuracy of all types of cuts and workpieces.



In the

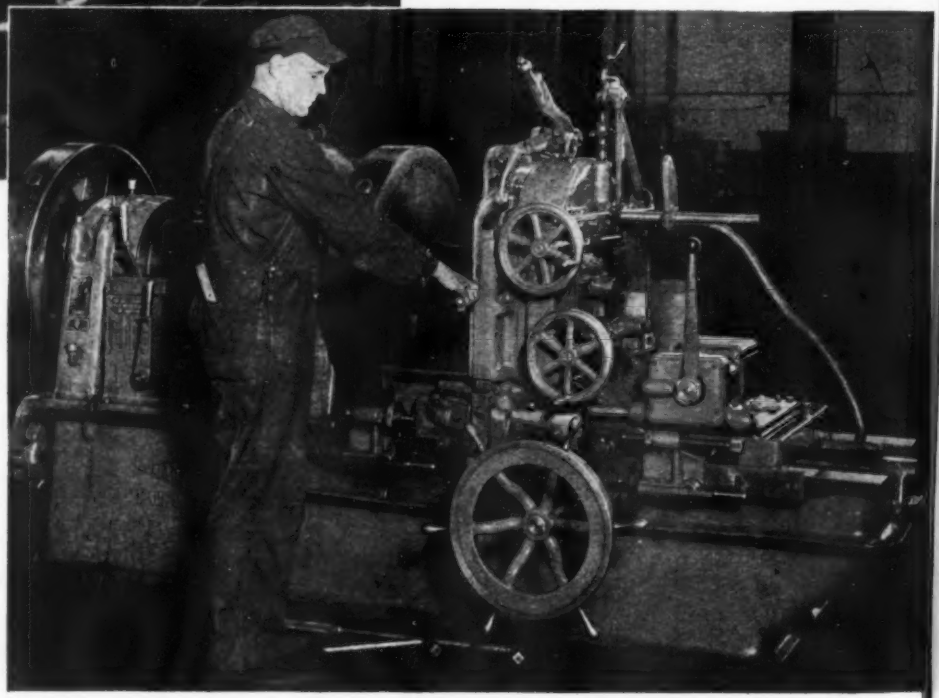
OIL FIELDS

AND TUBE MILLS

LANDIS

RECEDING CHASER PIPE THREADING AND CUTTING MACHINES ARE "MUST" EQUIPMENT

For These Machines Have Proven Their Superiority in Cutting Threads to The Close A.P.I. Tolerance Specifications at Continuous High Speed Production.



Where the threading of casing, tubing and drill pipe proceeds under unusually rigid inspection and on a high production basis 24 hours a day—the LANDIS Pipe Threading and Cutting Machine with the Receding Chaser Die Head has proven to be the most suitable machine for maintaining the exacting thread accuracy required.

LANDIS MACHINE COMPANY

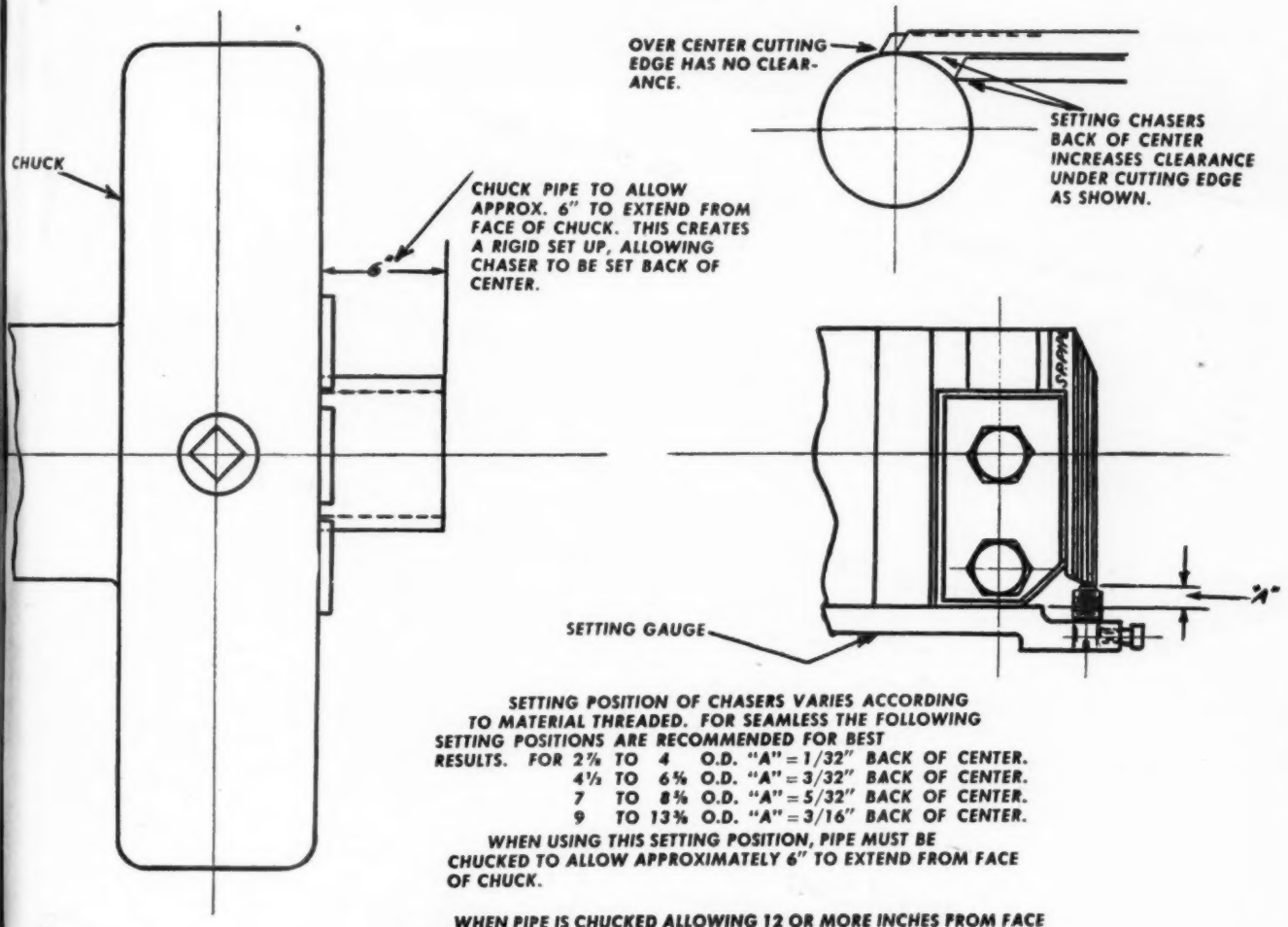
A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE MARK PAT. OFF.

THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

CHASER SETTING POSITION FOR SEAMLESS CASING FOR NON-RECEDING STATIONARY HEADS


CHUCK
CHUCK PIPE TO ALLOW APPROX. 6" TO EXTEND FROM FACE OF CHUCK. THIS CREATES A RIGID SET UP, ALLOWING CHASER TO BE SET BACK OF CENTER.
6"
OVER CENTER CUTTING EDGE HAS NO CLEARANCE.
SETTING CHASERS BACK OF CENTER INCREASES CLEARANCE UNDER CUTTING EDGE AS SHOWN.
SETTING GAUGE
"A"

SETTING POSITION OF CHASERS VARIES ACCORDING TO MATERIAL THREADED. FOR SEAMLESS THE FOLLOWING SETTING POSITIONS ARE RECOMMENDED FOR BEST RESULTS.

FOR	2⅞ TO 4	O.D.	"A" = 1/32" BACK OF CENTER.
	4½ TO 6⅝	O.D.	"A" = 3/32" BACK OF CENTER.
	7 TO 8⅝	O.D.	"A" = 5/32" BACK OF CENTER.
	9 TO 13⅜	O.D.	"A" = 3/16" BACK OF CENTER.

WHEN USING THIS SETTING POSITION, PIPE MUST BE CHUCKED TO ALLOW APPROXIMATELY 6" TO EXTEND FROM FACE OF CHUCK.

WHEN PIPE IS CHUCKED ALLOWING 12 OR MORE INCHES FROM FACE OF CHUCK TO END OF PIPE OR GRIPPED IN REAR CHUCK ONLY, CHASERS MUST ACT AS A SUPPORT AND CUTTING TOOL, THEREFORE CHASERS MUST BE ADVANCED TO CENTER, THIS DECREASES CLEARANCE.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

WAYNESBORO, PENNSYLVANIA, U.S.A.

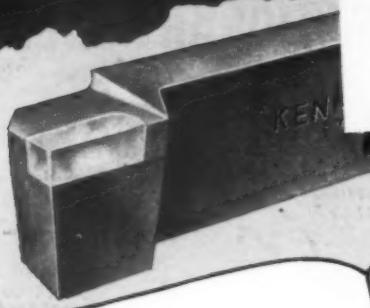
THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

Here's What KENNAMETAL HAS DONE

STYLE 11HD with "Clamped-On" Kennametal blank

STYLE 11 with "Screwed-On" Kennametal blank

that other cutting tools COULD NOT DO!



STYLE 1

on Sandy Iron Castings

Turned cast iron piston trunks—21⅛" diameter x 45" long—high in silicon, manganese, and carbon; very sandy surface; chilled around port holes. Showed practically no wear after machining three complete castings. This was Kennametal's *new* and *improved* tungsten carbide Grade K6.

Other makes were unable to take shock of interruptions, or withstand the highly abrasive cutting—could not complete one casting.

on Tough, Aluminum Bronze

Rough turned scaly Ampco metal bar stock—6" diameter x 14" long—continuously for 8 days. After turning 224 pieces (equivalent to 85 miles of lineal cutting) Kennametal tool did not need regrinding.

With other tools only one-fourth as many pieces could be machined before resharpening was needed.

on Chrome Nickel Steel

Rough turned very scaly chrome nickel forging—2' diameter x 10' long—in 30% less time, and with triple the tool life obtained from other tools, which could not stand up under the plunge cut through scale.

on Monel Metal

Bored 4½" hole in 6' long solid monel metal forging, to accurate size, in 32 minutes. HSS tool required 10 hours; sometimes produced up to .040" taper, due to wear, which required reboring.

on 14% Manganese Steel

Successfully rough and finish bored and turned huge casting. (High manganese steel is usually ground rather than machined because it hardens under cutting tool pressure.)

on "Everyday" Jobs, Too

The tool that takes tough jobs in stride is the one to use on routine production runs where overall cost-per-piece is the important factor. This is conclusively proved by official reports covering consumption of cemented carbides used during the war for machining 105mm shells:

- Where cemented carbide tools other than Kennametal were used, average carbide consumption per shell produced was approximately 3 *calculated grams*.
- In typical plants using Kennametal exclusively, average consumption per shell was *only ⅛ gram*.

In other words—Kennametal Tools were up to 6 times as serviceable—a fact of utmost significance to all who must now manufacture post-war products—*economically*.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

HOODOO SMASHERS!

America's newest and widest line of V-Belts—Allis-Chalmers' Texrope — solves problems that have hoodooed drives in almost every industry . . . see what they can do for you!

I ROUT THAT OLD BUGABOO, STATIC ELECTRICITY. I'M STATIC-RESISTING SUPER-7. MY BUILT-IN CONDUCTING ELEMENT CARRIES CHARGES TO THE MACHINE WHERE THEY'RE GROUNDED.

Texrope V-belts are available nation-wide through Allis-Chalmers Dealers and Sales Offices

IT PAYS TO MAKE

ALLIS-CHALMERS

YOUR V-BELT DRIVE HEADQUARTERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by A-C.

BULLETIN!

SPEED RECONVERSION WITH HELP OF NEW FREE A-C KIT!

Guide to "How to Take Reconversion Inventory" of Drives, Motors, Pumps

Help in the big job of reconverting for peacetime production is now offered to plants everywhere by Allis-Chalmers Mfg. Co., its district offices and distributors. To all who request it, we're sending the new "Reconversion Inventory Kit", planned to speed the task of determining the condition of your existing equipment — V-belt drives, motors, and centrifugal pumps — which will be used in reconverted production.

SUGGESTS PROCEDURE, STATES STANDARDS

Used by foremen, maintenance men, and engineers, the Kit is a real time-saver . . . leads efficiently to probable trouble spots, helps clear them up. Gives bearing tolerances, resistance formulae, etc., in compact, easily-used form. Check List appraisal charts help determine present and future condition of units inventoried.

HOW TO GET YOUR KIT

For your free Reconversion Inventory Kit, call your nearest Allis-Chalmers distributor or district office, or write Dept. 22, ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wis.

A-1910

ALLIS-CHALMERS MFG. CO.
Dept. 22, Milwaukee 1, Wis.

Please send Reconversion Inventory Kit free of charge to:

Company.....

Address.....

.....

Attn. of Mr.....

NEW and IMPROVED 12" x 28"

FOR *Every* GRINDING OPERATION

CYLINDRICAL

INTERNAL

TAPER

SURFACE

TOOL SHARPENING

FORM TOOL

UNIVERSAL and TOOL GRINDER

✓ Multi-Purpose
✓ Flexible Operation
✓ Close Accuracy

Keep your metalworking tools sharp with the new and improved Landis 12" x 28" Universal and Tool Grinder. This modern grinding machine offers speedy, accurate grinding on a large variety of tool room work with standard equipment By means of additional attachments that are available, an exceptionally wide range of grinding jobs can be handled.

Design improvements in this new model include: Universal headstock, spindle and face plate mounted on super-precision preloaded ball bearings; live and dead spindle, converted instantly; variable voltage drive; special protection for all bearing surfaces and working parts from grit and coolant for both wet and dry grinding

Faster production on small grinding jobs is made possible with the Landis 12" x 28" Universal and Tool Grinder, through ease of setup, quick change-over from one setup to another plus the Universal features which include swiveling headstock and swiveling grinding wheel. Surface tolerances can be held to instrument and aircraft accuracy through these exclusive vibration-reducing Landis features: ANNEALED CASTINGS, DYNAMICALLY BALANCED PARTS, WHEEL SPINDLE MOUNTED ON PRELOADED BALL BEARINGS

For further information on the most modern and complete Universal and Tool Grinding Machine offered to the trade, request Catalog K-45. 35

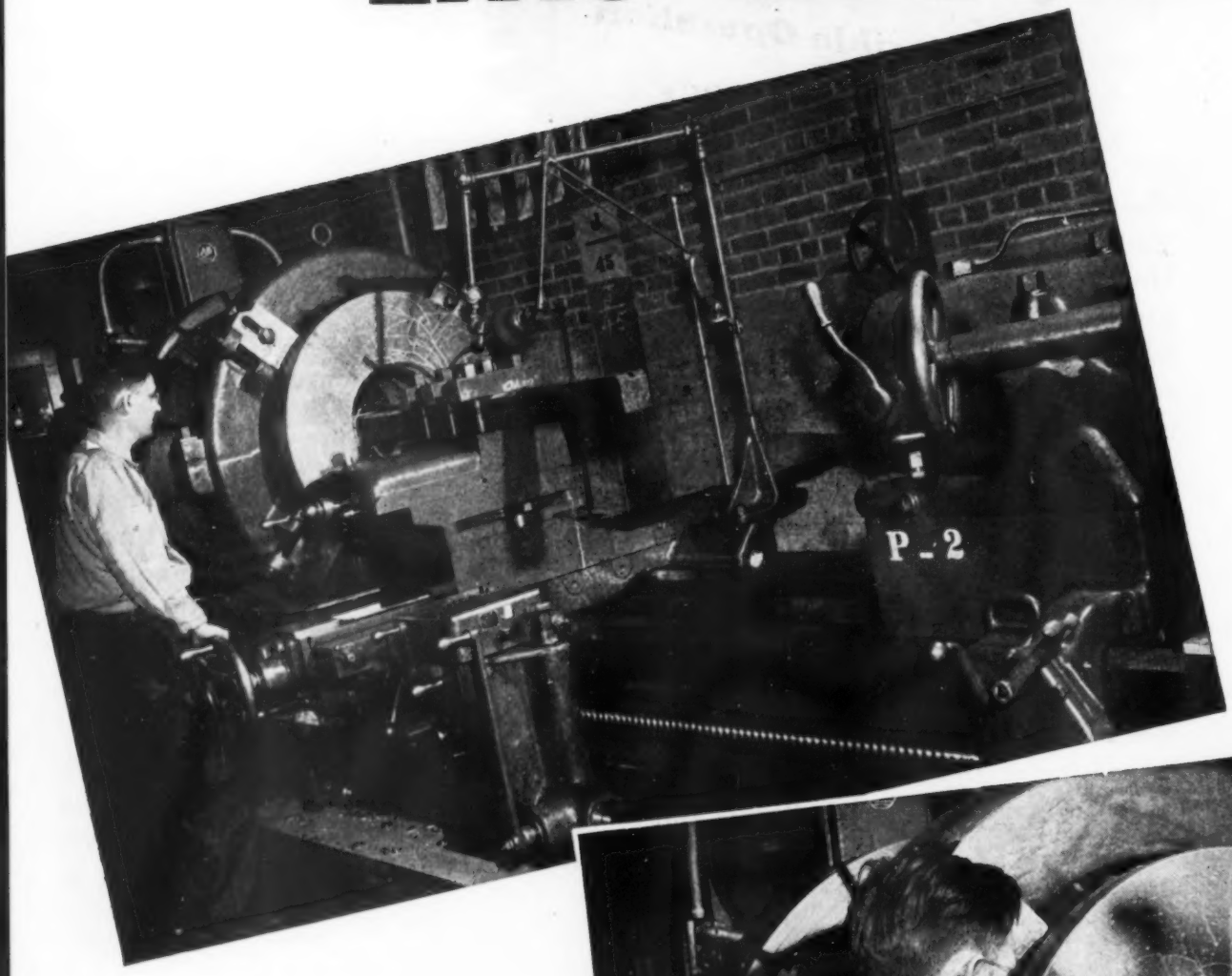
CONDENSED OPERATING DATA

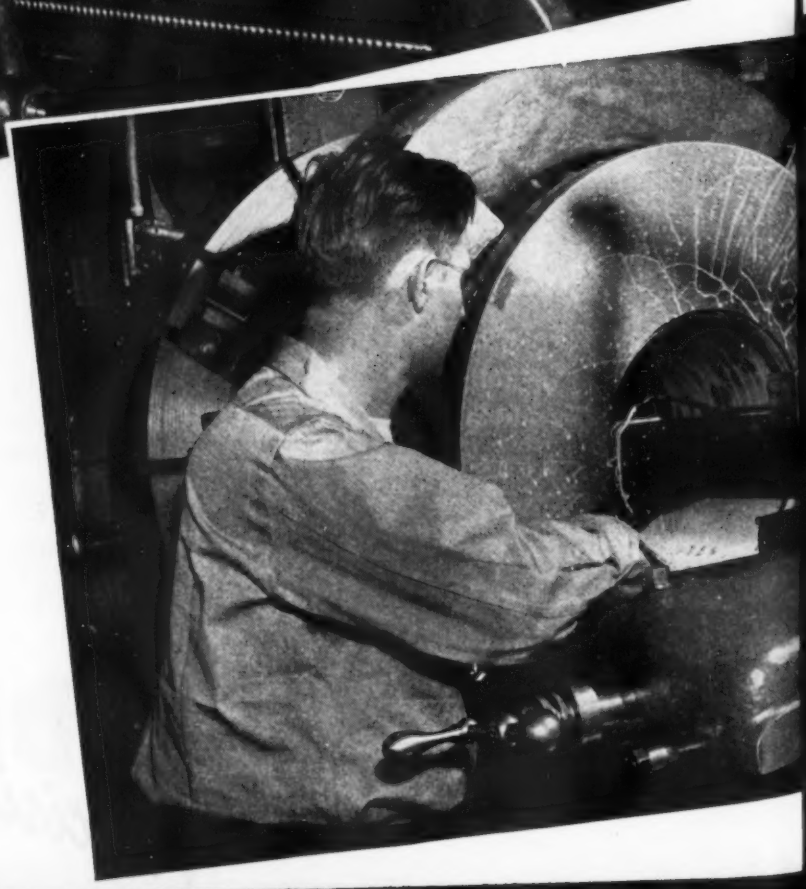
Max. Dist. Between Work Centers 28"
Max. Work Swing 12⅜"
Max. Work Dist., Full Size Wheel—12"
Work Speed rpm. 85 to 483
Traverse Speed Range per min. 12"—23"—43"—85"
Headstock—swivels each way 90°
Grinding Wheel
Head swivels each way 90°
Wheel Feed Increment Range .0001"—.001"

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY • WAYNESBORO, PENNA.

Like all True





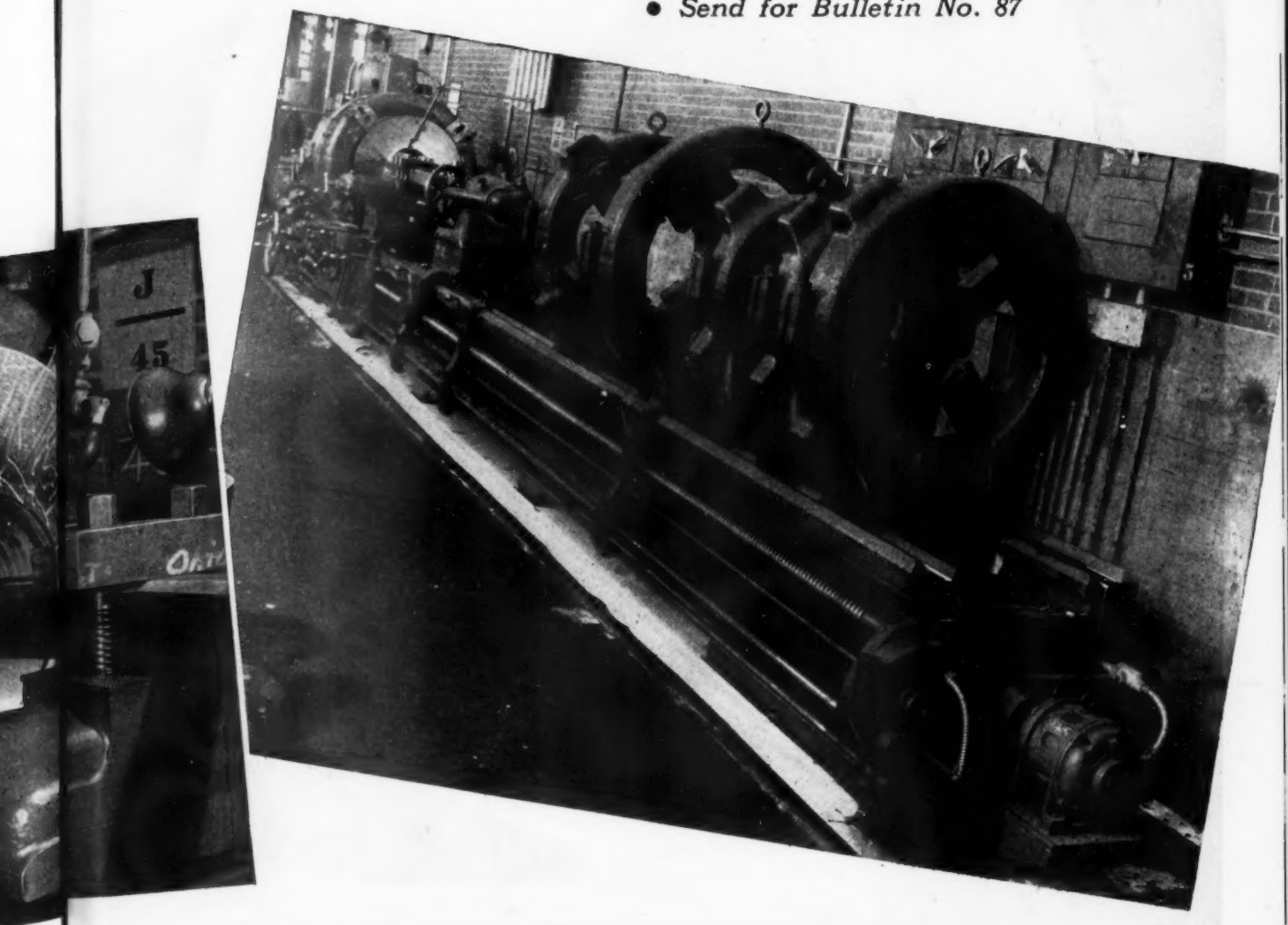
THE AMERICAN TOOL WORKS C

AMERICANS...

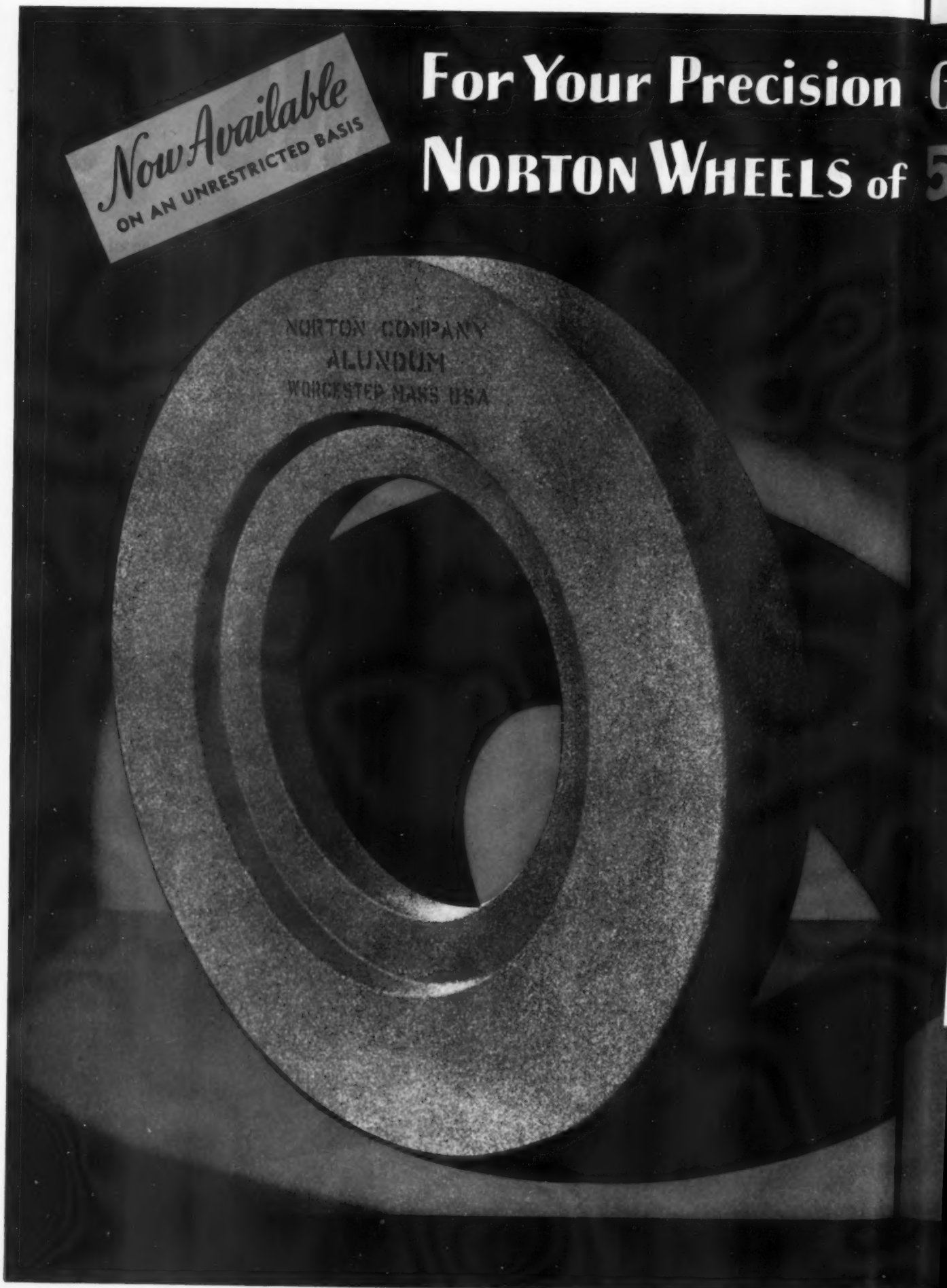
"AMERICAN" Lathes, from the smallest to the largest, are meeting the challenge of production like all true Americans. The power, stamina and endurance built into "American" Lathes have proven invaluable to many a production plant operating on an around-the-clock schedule. Dependable service, minimum shut-down for failures and repairs, coupled with an almost unbelievable ability to "keep going" under any and all conditions, are genuine "American" characteristics. "American" Lathes are easy to operate, too—another feature that appeals to the operator as do their simplicity of design and complete freedom from complex mechanisms and manipulations.

"American" Lathes are an asset in any plant.

• *Send for Bulletin No. 87*



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**


Now Available
ON AN UNRESTRICTED BASIS
For Your Precision G
NORTON WHEELS of 5
NORTON COMPANY
ALUNDUM
WORCESTER MASS USA

n Grinding Jobs . . .
of 57 ALUNDUM ABRASIVE

57 ALUNDUM abrasive has very definite advantages for precision grinding. It combines the strength and toughness of regular Alundum abrasive with the cool cutting, self-sharpening features of 38 Alundum abrasive. Used in wheels for cylindrical and centerless grinding it gives a faster grinding action and longer life; dressings are considerably reduced.

On many critical war jobs 57 Alundum Grinding Wheels made truly outstanding records — but supplies were limited. Now enlarged production facilities make 57 Alundum abrasive available on an unrestricted basis. These wheels can be an important factor in reducing precision grinding costs on peacetime products.

Get in touch with your Norton abrasive engineer for definite specifications.

NORTON COMPANY • WORCESTER 6, MASS.

Distributors in All Principal Cities W-1028

NORTON ABRASIVES

CYLINDRICAL

"20% better than previous wheel—cuts faster, holds up better, the excellent finish produced eliminates honing operation." (57A80-N6VBE grinding steel pistons)

"Best wheel ever had on job—lasted 15 weeks." (57A50-L7VBE grinding assembled crank case forgings)

"Cut fast, held good radius, used for 35 eight-hour shifts grinding about 30,000 pieces. Best wheel they ever had." (57A60-L7VBE finish grinding hard forged shafts about 4" diameter, 10" long)

CENTERLESS

"Cut faster and lasted once and a half longer than competing wheel. Held corners and size exceptionally well." (57A60-M5VBE grinding miscellaneous steel spindles)

"Very satisfactory — good cutting action and life, few dressings required." (57A100-K7VBE grinding rods and tubing of hard chrome molybdenum and chrome plated)

"Excellent wheel — will adopt in place of competing wheel now in use." (57A60-P5VBE grinding shock absorber pistons of cast iron and semi-steel)

FOR TOOL GRINDING — too, 57 ALUNDUM wheels are making outstanding records

Weighing only 40 pounds, this compact power take-off unit for British bombers transmits 40 hp. It demands the highest precision machining and assembly of parts processed almost to laboratory standards. Monarch is the only plant in America entrusted with its production.

We've gained this skill in close tolerances over the years of building fine Monarch Lathes. Much of the turning, boring and facing of parts for this power unit is done on our own turning machines, demonstrating their ability to meet the most critical requirements of aircraft production.

This broadening experience gained by our operators will help them build better Monarchs from the improved designs of our engineers. Your new Monarchs will enable you to produce faster, more economically and more accurately than ever before.

See your nearest Monarch representative about present or future turning problems.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

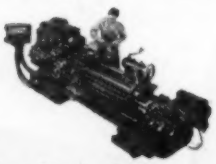
INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

SAVE TIME, MONEY, MATERIALS WITH MONARCH TURNING MACHINES

New Monarch 10" x 20" Sensitive Precision Toolmaker's Lathe.



New Monarch Shapemaster Formturning Machine.

One of three types of Monarch's new 10" Hi-Speed Precision Turning Machines.

Improved Monarch Fully Automatic Magnamatic Turning Machine.

Aircraft Unit
Monarch Saves Time

ARMSTRONG

The "Armstrong System" permits *the new higher cutting speeds*

The urgencies of war have lead to the universal use of greatly increased cutting speeds. Today it is not uncommon to find production machine tools actually operating *many times faster* and with greater efficiency than the "standard" cutting speeds of past generations permitted. What is not generally understood is that a similar step-up is equally practical for ordinary operations on standard tool room lathes, planers and shapers.

With the correct ARMSTRONG TOOL HOLDERS for each operation and modern ARMSTRONG HIGH SPEED, ARMIDE (Carbide-Tipped) and ARMALLOY (Cast-Alloy) Cutters, Bits and Blades, you can safely increase both speeds and feeds materially, reducing machining time per operation or piece and substantially raise your output per machine-hour.

With the Armstrong System you can make this change-over to high speed operation at will, for ARMSTRONG TOOL HOLDERS and ARMSTRONG CUTTERS are stocked by the leading industrial tool departments in your locality and can be purchased as needed. Start the "modernizing" program now, write for catalog.

ARMSTRONG BROS. TOOL CO.

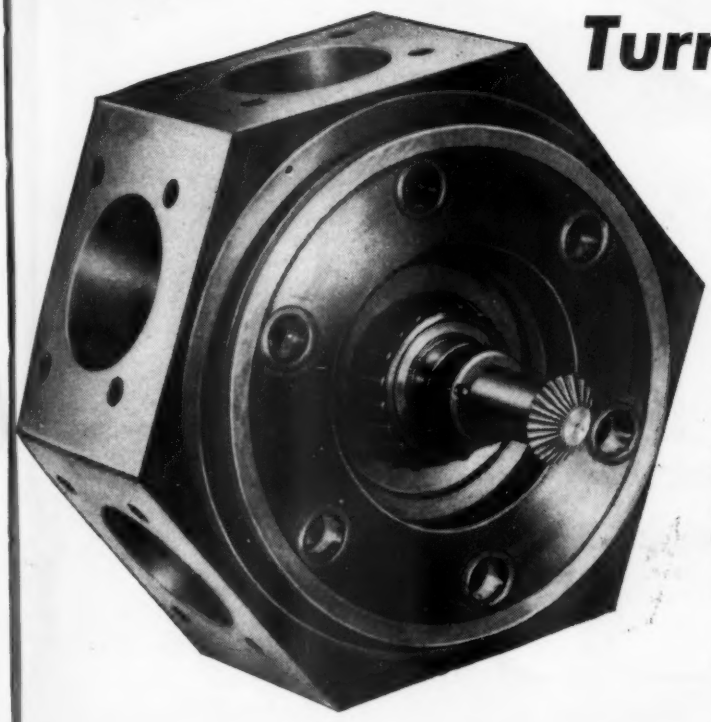
"The Tool Holder People"

315 N. Francisco Ave. Chicago 12, U.S.A.
Eastern Whse. & Sales:
199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office:
1275 Mission St., San Francisco 3, Calif.

Buy ARMSTRONG TOOLS from your Factory House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

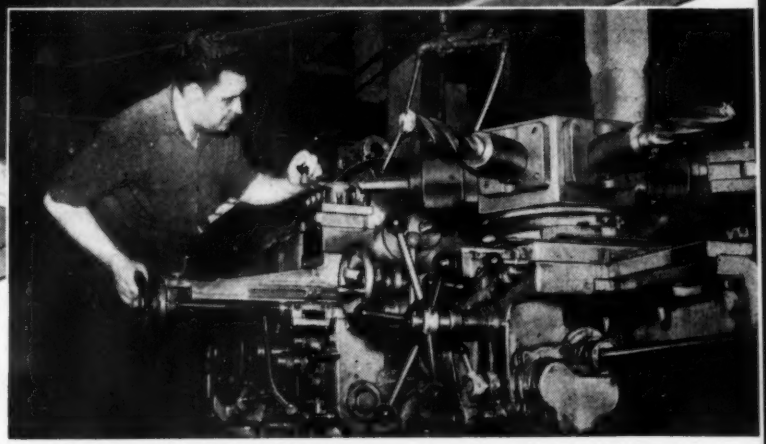
The MOST POWERFUL
Turret Clamp Known



You can't do accurate machining with a tool that chatters. That's why Gisholt takes no chances—why Gisholt provides the most powerful turret clamp found on any turret lathe.

Gisholt's heavy-walled hexagon turret is mounted on a strong, heavy carriage with exceedingly large bearing surface on wide bedways of hardened steel. Long guides for lateral alignment and square lock gib construction assure a snug, rigid mounting at all times. Turret and saddle are flanged to mate with a double bevel steel clamping ring, which is operated by a self-locking cam linkage and long lever. This cam applies very great pressure in the closing of the ring, a mechanical advantage approaching infinity, which assures a tremendously strong and rigid clamping of the turret with extremely light operating effort.

Gisholt's powerful turret clamp is but one of many reasons why you can depend upon Gisholt accuracy now and for years to come.



GISHOLT

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

All features of Gisholt design are aimed at firmly held, smooth-cutting tools to assure greater accuracy and permit the highest possible cutting speeds. Write for literature.

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

WHAT'S AHEAD-

You Can Eliminate One Worry By Planning Now to Make Use of Ex-Cell-O's Complete Parts Production Facilities

Don't gamble with the quality of your product . . . plan to use Ex-Cell-O precision production parts! With a complete organization under one responsible management . . . an organization built up of years of varied engineering experience, modern machine and manufacturing methods, and complete heat treat facilities, and practical assembling and inspection staffs . . . Ex-Cell-O probably has the exact solution to the parts production problem you face.

SEE EX-CELL-O FIRST

EX-CELL-O CORPORATION D

FOR YOUR BUSINESS?

To left: **Typical of the many modern and complete production machines in the Ex-Cell-O Miscellaneous Precision Parts Division—*facilities that are available for the production of accurate parts and sub-assemblies for your product*—is this sectional view of single automatic screw machines.**

XLD

EX-CELL-O *for* PRECISION

EX-CELL-O's *facilities:*

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

HEAT TREAT

Induction Heating
Laboratory for Heat Treat Control Including Micro Examination and Photography
Atmosphere Control Continuous Hardening Furnaces
Atmosphere Control Box Hardening Furnaces
Various Types of Air-Draw Batch Type Furnaces
Gas Carburize Furnaces
Box Carburize Furnaces
Pack Anneal Furnaces
Nitriding Furnaces
Cyanide, Lead, and Neutral Salt Pot Furnaces
High Speed Steel Atmosphere Control
Vertical and Horizontal Hardening Furnaces
Continuous Air-Draw Furnaces
Sub-Zero Heat Treating Equipment

PRODUCTION MACHINES

Multiple Vertical Turret Lathes
Multiple Spindle Automatic Screw Machines
Single Spindle Automatic Screw Machines
Hand Screw Machines
Centerless Grinders
Single and Multiple Spindle Drilling Equipment
Plain O.D. Grinders
Plain I.D. Grinders
Milling Machines
Broaching Machines
Precision Thread Grinders
Precision Boring Machines
Lapping Machines
Special High Production Equipment

UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.

45—85

NDETROIT 6, MICH.

J&L SPECIAL COLD DRAWN SHAPES

bright, smooth, accurate—special cold drawn steel sections save machining in countless applications. Our metallurgical engineers will be glad to discuss your production problems with you.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The National Research Council is compiling a directory of industrial research laboratories of which there were 2,264 in 1940 when the last listing was made.

get ready with CONE for tomorrow

Said to be the largest government-owned plant yet leased for civilian use, a 21 million dollar factory is being converted for the making of streamlined trains. *Edward G. Budd, Philadelphia.*

get ready with CONE for tomorrow

Experimental track-type tractors are using rubber tracks quite similar to those used on children's toys. *B. F. Goodrich.*

get ready with CONE for tomorrow

A new technique, using an electric arc, makes it possible to cut industrial diamonds four times faster than the conventional method. *National Bureau of Standards.*

get ready with CONE for tomorrow

An aviation magazine estimates that American domestic and international air carriers will put almost $750,000,000 in equipment in the next five years. *Aviation News.*

get ready with CONE for tomorrow

A unique type of power transmission, which is positive and yet prevents gear breakage in case of jamming, uses metal gears meshed with gears of an elastic vinyl resin. *Resistoflex Corp.*

get ready with CONE for tomorrow

Tooling has begun for the production of a calculating machine that automatically figures dividends, hourly pay rolls, writes checks and keeps records at 4,000 per hour speed. *Addresso-Multigraph Corp.*

get ready with CONE for tomorrow

A dry cell developed for the Army is reported to have 5 times the shelf life of ordinary batteries. A 93.6 volt radio battery of 72 cells weighs only 2 pounds. *Engineering & Mining Journal.*

An oxy-acetylene cutting unit developed by the Navy can be carried on the operator's back and used without setting it down.

get ready with CONE for tomorrow

One of our admirals reports that welded ships have proved to be stronger than riveted ones during the war. *Admiral Emory S. Land.*

get ready with CONE for tomorrow

The American optical industry is now producing, by automatic, mass production methods, lenses superior to those formerly made by hand in Germany.

get ready with CONE for tomorrow

The Army has been using a very compact radio communication system that can carry facsimile pictures, telephone conversation and teletype messages all at once.

A new pocket-size instrument reports power output and efficiency to the pilot of a plane by measuring constantly the deflection of the engine under the force of explosions. *Consolidated-Vultee.*

get ready with CONE for tomorrow

Claims for a new rubber cement include adhesion to metals, plastics and ceramics; shear strength of 3,250 pounds per square inch and tension strength of two tons. *B. F. Goodrich, "Plastilock"*

get ready with CONE for tomorrow

The first section of the Society of Automotive Engineers to be established outside continental United States has been organized in the Hawaiian Islands.

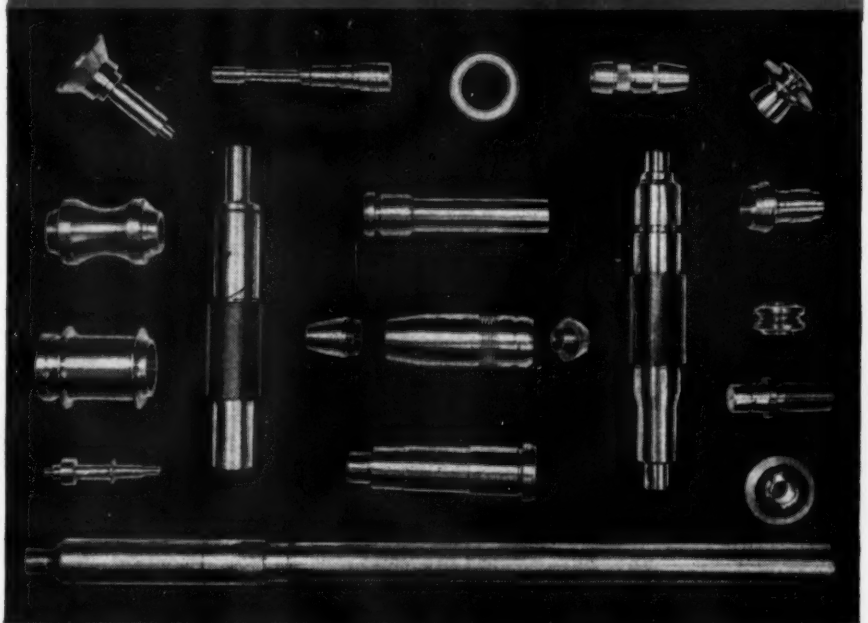
get ready with CONE for tomorrow

A new electrical device analyzes the composition of metal and indicates its maximum endurance. *Electrical Manufacturers Public Information Center.*

get ready with CONE for tomorrow

A new stainless steel is soft and ductile enough to be formed and fabricated like aluminum. *Rustless Iron & Steel Corp., Baltimore.*

Keep ahead with production savings from parts produced on the 8-Spindle Conomatic.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

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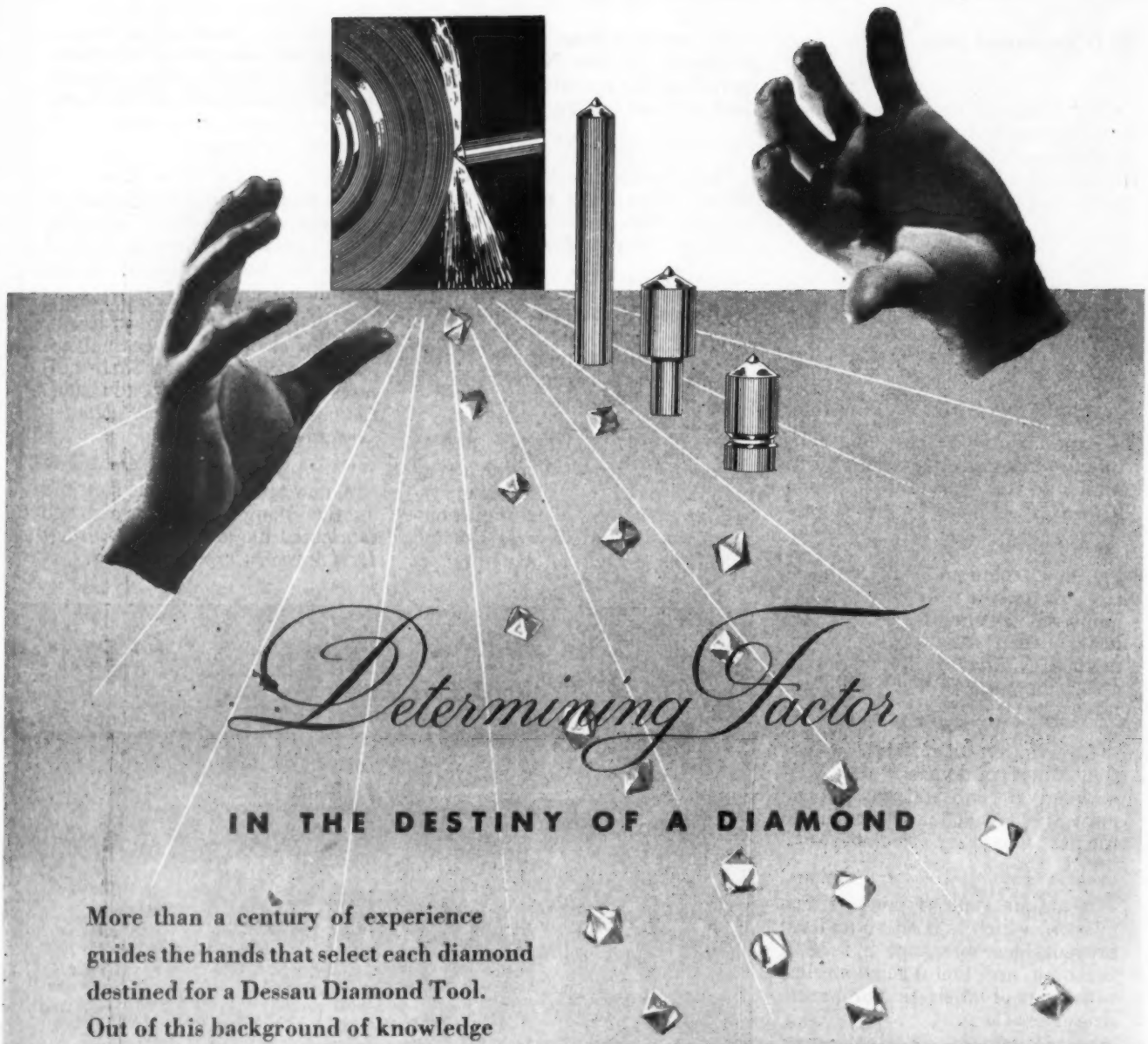


Determining Factor

IN THE DESTINY OF A DIAMOND

More than a century of experience guides the hands that select each diamond destined for a Dessau Diamond Tool. Out of this background of knowledge and skill have come many of the precision tools of war whose use has helped to gain the final victory. Now — as the problems of reconversion confront American industry — this same experience of 104 years is available to you in every Dessau Diamond Tool required for peace-time production.

MAURICE S.
DESSAU
COMPANY
★ *Diamond Tool Manufacturers* ★
535 FIFTH AVE. • NEW YORK 17

Westinghouse Speed Reducers

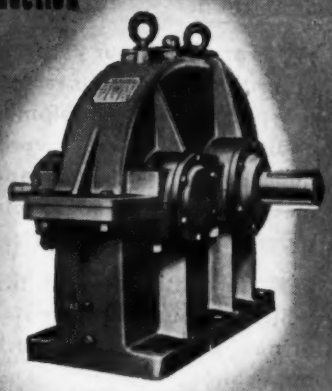
PRECISION MANUFACTURING METHODS AND FACILITIES AT WESTINGHOUSE RESULT IN THESE LONG-TERM ADVANTAGES:

- ***Quiet Operation and Long Life*** ... by the use of Single Helical Gears, cut by the Hobbing Process for maximum accuracy.
- ***Maximum Load-Carrying Capacity*** and higher resistance to wear and shock by Westinghouse exclusive BPT heat-treatment of Gearing and Shafts.
- ***High Operating Efficiency*** and low power losses in starting assured by precision machine work and use of antifriction type bearings.
- ***Reliable "On-the-Job" Performance*** through station-to-station inspection of parts during manufacture; running test of each assembled unit before shipment.

There is a Westinghouse speed-reduction unit for most applications.

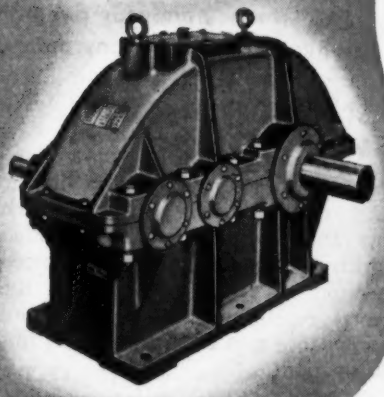
TYPE SH SINGLE-REDUCTION UNIT

Twelve unit sizes with thirteen standard ratios . . . rated for continuous duty . . . permit 100% starting and momentary overloads.



TYPE DH DOUBLE-REDUCTION UNIT

Twelve unit sizes with fifteen standard ratios . . . rated for continuous duty . . . permit 100% starting and occasional overloads.



Westinghouse is also prepared to build units of special design to meet your unusual requirements, such as limited space or other special operating conditions.

For drives that require speed reduction—and four out of five drives do need speed reduction—it pays to install Westinghouse Speed Reducers. They bring advantages that add up to lowest installed and operating costs.

A complete series of standard Horizontal Parallel Shaft Type Speed Reducers (as illustrated) are available for ratings from approximately 10 to 1000 horsepower, Gearmotors from 1 to 75 horsepower.

Consult Westinghouse on new drives, or modernization of old ones. Complete engineering service, and servicing facilities through nation-wide offices, warehouses and repair shops are available for your use. For details call your Westinghouse Office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-07230

Westinghouse Speed Reducers

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

BULLETIN!

How to Take a Reconversion Inventory of Your Electric Motors

☛ As new manufacturing equipment becomes more widely available, and as you reconvert your production toward a peacetime basis, you may be faced with an unprecedented problem of inventory-taking.

☛ You may have to determine — more quickly than such a job has ever been done before — the exact condition of every piece of existing equipment you propose to use in peacetime production.

☛ For about four years, far greater emphasis has been placed on setting production records than on keeping maintenance records; condition of equipment is often unknown. Because much equipment has been worked during wartime three and four times as many hours a year as in peacetime, calendar age may mean nothing. And repair has often depended on American ingenuity and baling wire.

☛ Here are some of the standards you need to determine which of your electric motors: (1) are okay as is, (2) need repair or new parts, (3) will shortly require replacement, (4) need reapplication.

☛ These standards generally apply to all makes of motors; when in doubt on any motor, consult its manufacturer.

1 START YOUR INVENTORY WITH THE RECORDS

Begin your motor inventory with the history of each motor; you'll save much time and effort . . . you'll be guided quickly to the units which most need attention. Written records and the mental recollection of foremen and maintenance men are the source of this information.

Check the *master maintenance records* (though in most plants this file is out-of-date and incomplete, because of wartime pressure on production); and get *reports from foremen* (in a small plant, it may be possible to interview each man; in a large plant, it may be more efficient to distribute blank forms, such as the "MOTOR CHECK LIST" on opposite page.)

Look into the service to which the motor has been subjected in wartime: has it been overloaded? underloaded? worked 3 shifts daily? allowed to go to work in spray, steam, flood, acids? has it had mechanical injury? has it stood idle, collecting moisture and dirt?

Knowing the answers to these questions will help you spot motors that may soon give you trouble . . . you can start your inventory there.

NOTE: All new motors built during wartime, under WPB limitation orders, contain minimum amounts of critical materials. Thus, unlike many prewar motors, they have been incapable of withstanding continued overload operation in the way you've come to expect high-grade American motors to do. Moreover, you've had to take motors at the ratings you could get, without much regard to the exact requirements of the application. Thus, many motors have been running harder and at higher temperatures than nameplate ratings call for. Obvious result of this combination of factors is shortened insulation life. So—*expect* trouble where wartime motors are misapplied.

2 THEN CHECK MOTORS IN OPERATION

Obviously, the easiest and most practical measure of a motor's present condition is the way it is now operating. You can't learn all you need to know about its probable future performance by observing it in use, but a motor does reveal certain symptoms of trouble while doing its job.

Check the power line voltage and frequency and compare with the voltage and frequency of the motor as stated on the nameplate. To perform properly, a motor must be supplied from a line whose characteristics correspond with those for which the motor was designed.

Check rpm — hand revolution counter makes this easy. Just remove cap, hold counter against end of shaft, and take a timed reading; compare with nameplate rating.

Take temperature readings — not by the "blistered hand" or "touch and yell" system, but *accurately*, with *thermometers*.

Find the temperature of the *motor* by taping or cementing thermometer to the stator iron . . . take the reading, and add 15°C. (The difference between the heat on the outside surface and the possible heat of the hottest part inside).

Compare motor temperature with temperature rise rating on the nameplate. Normally a 40° rise is considered acceptable; top temperature usually should not exceed 80°C.

Take the temperature of *bearings*

either by taping or cementing thermometer to the bearing housing, or by inserting it into the oil well. In general, maximum safe bearing temperature is 96°C. (Bronze bearings may take somewhat higher temperature safely. When in doubt, consult motor manufacturer.)

Listen for — EXCESSIVE HUM. May be caused by uneven air gap, and may call for replacement of bearings. Or it may be caused by loose laminations or unbalanced rotor. Note this hum while inspecting motor in operation; check for cause later, while making inspection of parts.

Note — VIBRATION. If excessive, this may be caused by either misalignment between shafts of motor and driven machine, or through transmission of vibration in driven machine to the motor. Run motor disconnected for check. *If vibration follows motor repair,* it's probably due to out-of-balance rotor.

Listen for — RAPID KNOCKING. May be caused by misalignment, with shoulder of shaft pounding against bearing end; realign set . . . and note this knock, check bearings when making inspection of parts.

NOTE: if excessive vibration, knock, or squeal follows re-assembly of motor, cause may be incorrect axial adjustment for float.

Look for — EXCESSIVE SPARKING OF BRUSHES. Check for cause when motor is taken down for inspection.

3 THEN CHECK THE PARTS

If time permits, you'll want to give detailed inspection to *every* motor that's been in strenuous service these past years. (You may be able to work this into your regular production schedule. Set up a system so that the electrical department may be notified whenever a machine is to be down. Disassembly and inspection of motors can be done then.)

And in cases where *history* of the motor or its *operating characteristics* indicate the likelihood of present or future trouble, you'll surely want to take a close look at the parts themselves.

A. FIRST — disconnect motor leads and uncouple motor from driven unit.

B. THEN — if excessive hum was noted while motor was in operation, use feeler gauge to check air gaps between rotor and stator. Difference of more than 20% indicates overworn bearings, sleeves, or journals. Check bearings as indicated below.

C. REMOVE end housing and lift rotor out, using a sling if rotor weighs over 75 pounds. If rotor is dirty, clean it with air hose (pressure not over 30 lbs), bellows, or vacuum cleaner, or swab it with non-inflammable solvent.

D. INSPECT rotor for abrasion; corrosion; discoloration (caused by overheating.) In squirrel cage motor, check also for loose or broken rotor bars.

E. IF ROTOR or armature is the wound type, check for loose banding. If any looseness is noted, band with new wire before putting motor back in service. If band assembly has not failed extensively — perhaps only a solder failure at one or two clips — repair can usually be effected simply by resoldering. Major rebanding, however, is a job for experts.

F. CHECK INSULATION — As motors get older, or as they operate continuously at high temperatures, insulation on coils tends to become brittle. It may start flaking off, cutting its insulating value. This may not affect motor performance seriously *except* that it may lead to short circuits or grounds, excessive vibration (out-of-balance rotor), or clogging of the air vents (leading to overheating) or abrasive wear from fallen particles. SO — check insulation visually . . . see whether pieces of insulation have torn or flaked off . . . and also make a megger (megohmeter) test. For a clean, dry motor at 75°C, insulation resistance in megohms, according to the American Standards Association, may be found by the formula:

$$\frac{\text{Rated voltage of motor}}{\frac{\text{Rating in KVA}}{100} + 1000} = \text{Insulation Resistance in Megohms}$$

G. CHECK BEARINGS — to remove ball bearings, use a puller, applying pressure to the inner race only, maintaining uniform pull all around, to avoid distorting the bore of the race.

Check bearings for excessive wear, scoring, or pitting.

To examine *anti-friction bearings,* first clean them thoroughly with kerosene to remove all old grease and dirt particles; then hold inner race and rotate outer race, feeling for roughness of action and listening for noise.

Inspect sleeve bearing clearance with feeler gauge. Normal clearances may be computed this way: take 0.003" as the basic tolerance . . . then add 0.001" for each inch of shaft journal diameter. Inspect journal surfaces; if scoring seems excessive, consider replacing.

If bearing shows no excessive wear, the hum of the motor in action may result from out-of-balance rotor or armature. Check this on parallel bars.

H. CHECK for cause of sparking. Check mechanical condition of parts. (For details, see Reconversion Inventory Kit, offered below.)

4 NOW MAKE THE APPRAISAL

With all the facts in hand — history, operating characteristics, condition of parts — your electrical department will be best prepared to assign this motor to its new role in reconverted production. Use check list forms like this —

RECONVERSION INVENTORY CHECK LIST FOR ELECTRIC MOTORS

1. History of Motor
2. Operating Characteristics
3. Detailed Inspection

TO BE FILLED OUT BY ELECTRICAL DEPARTMENT

for easy inspecting and appraising. Your nearby Allis-Chalmers district office or distributor will supply free copies of this Check List in whatever quantity you require.

CENTRIFUGAL PUMPS, V-BELT DRIVES, NEED INVENTORY TOO!

To speed your Reconversion Inventory of the most common industrial units, Allis-Chalmers has prepared a Reconversion Inventory Kit covering Electric Motors, Centrifugal Pumps, and V-Belt Drives. No big package, this kit is simply a set of Fact Sheets and Check Lists covering each type of unit, with suggestions for inventory procedure as outlined in these pages, but in somewhat greater detail.

A 1901

GET THESE FREE FORMS

For your supply of Reconversion Inventory Kits, covering motors, pumps, and v-belt drives, call your nearest Allis-Chalmers district office or distributor or write Dept. 421, ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

ALLIS CHALMERS

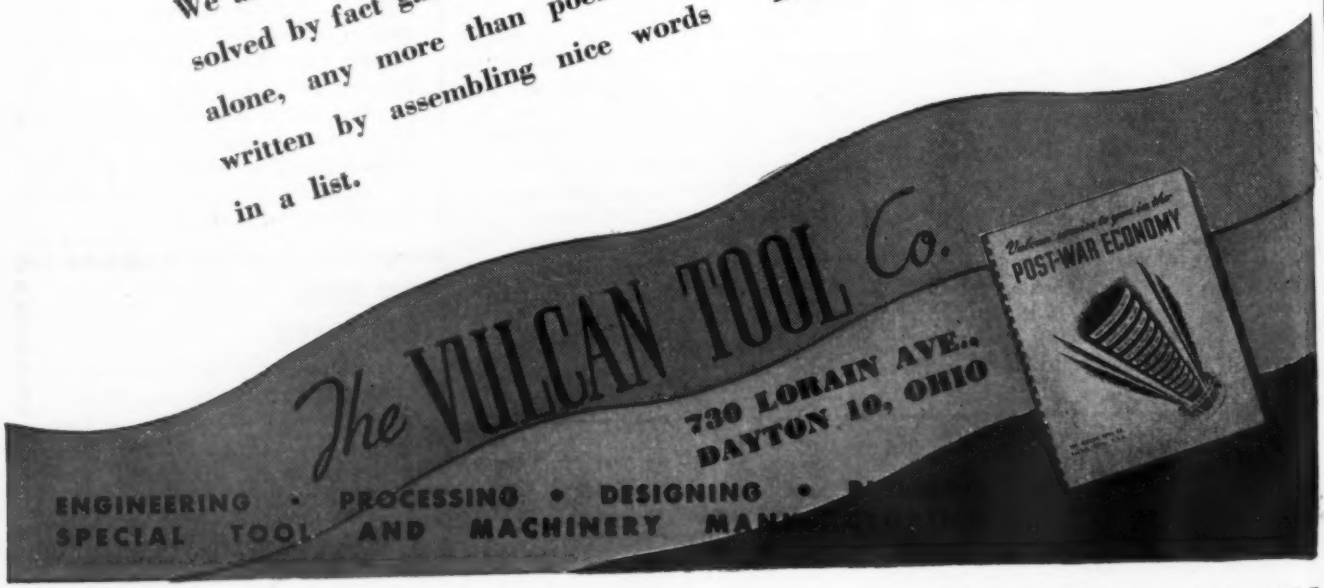
MIND POWER CRACKED THE ATOM

No single man, no single laboratory, no single country cracked the atom and built the atomic bomb. It was important that many men brought their facts together, but more important that they brought their minds together and sharpened each other's

We all know that problems are not solved by fact gathering and listing alone, any more than poems are written by assembling nice words in a list.

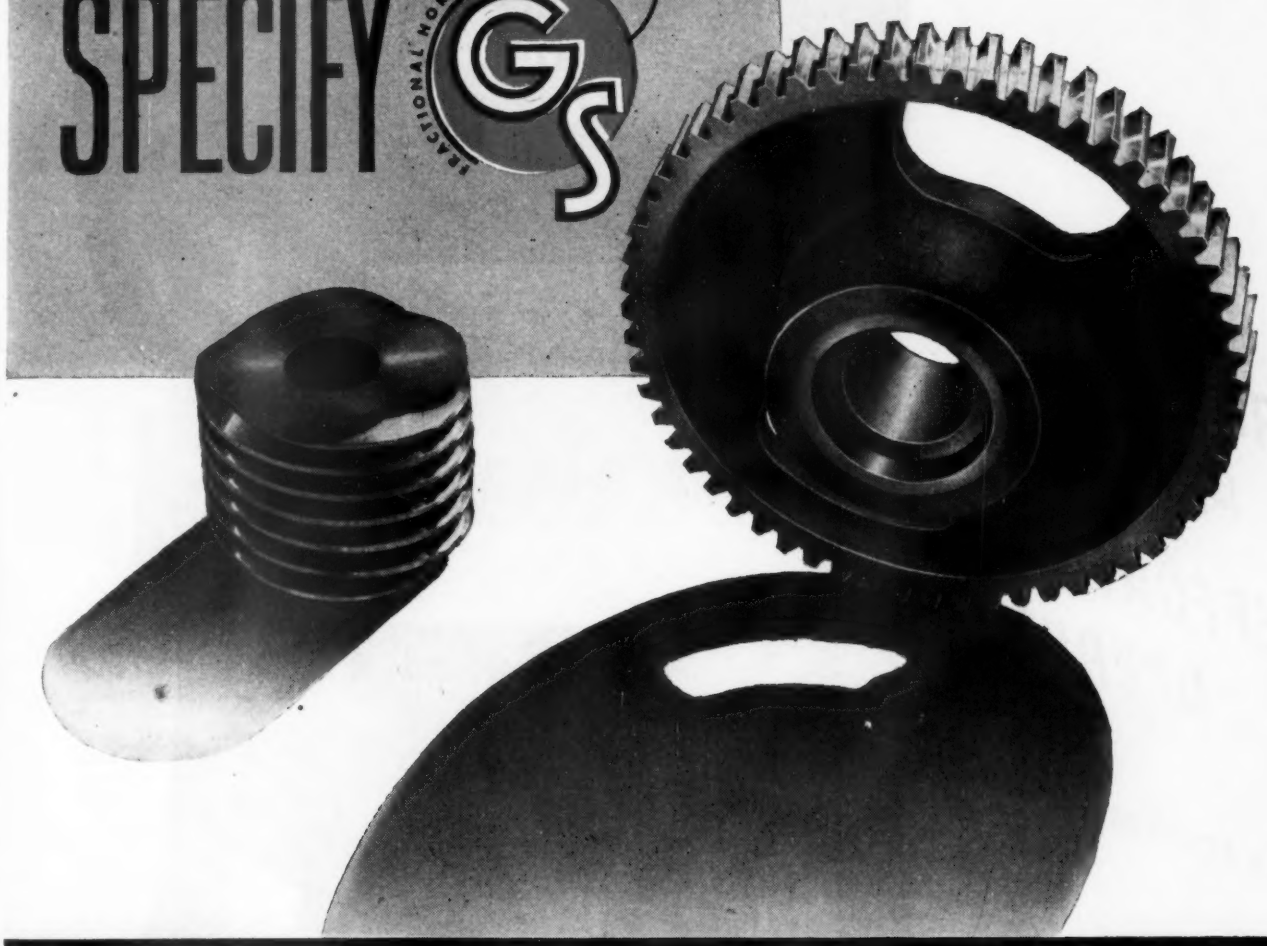
Interpretation, imagination, reason and inventiveness must see the bearing of facts upon each other and create new products and processes out of new relationships.

Thus when your tool engineers and ours get together they form a cyclotron of mind power and close a circuit of creativeness which cracks problems that may have appeared insoluble.



SPECIFY G-S

FRACTIONAL HORSEPOWER GEARING



GUARANTEE THE UNIFORMITY OF YOUR SMALL GEARS

Our day in year out job is the manufacture of small gears so unvaryingly precise that rejections are an almost unbelievable fraction. Hypercritical inspection —manufacturing processes—design—expert craftsmen—know-how gained from 25 years experience specializing in small gear manufacture . . *all* add their share to a reputation justly gained for superlative workmanship. If you would reduce your post war small gear rejections to the smallest known degree—specify G-S when you need fractional horsepower gearing.

FRACTIONAL HORSEPOWER GEARS

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

ACCURATE PRODUCTION · EFFORTLESS OPERATION

at 33 strokes per minute

When your plans call for Presses—dependable Mechanical Power Presses—consult Cleveland, because our sixty-four years experience in the field of Metal Working Tools has given us some pretty definite, practical ideas of what is required in the line of Presses for the accurate and economical production of pressed metal parts.

Whether your requirements call for small Open Back Inclinables or the very largest Four Point Presses, you will find that Cleveland machines embody every desired feature for long life and dependability, and that each type can be furnished in sizes and capacities to meet every need.

Cleveland Straight Sided Double Crank Press, single geared, single end drive, equipped with electrically controlled air friction clutch.

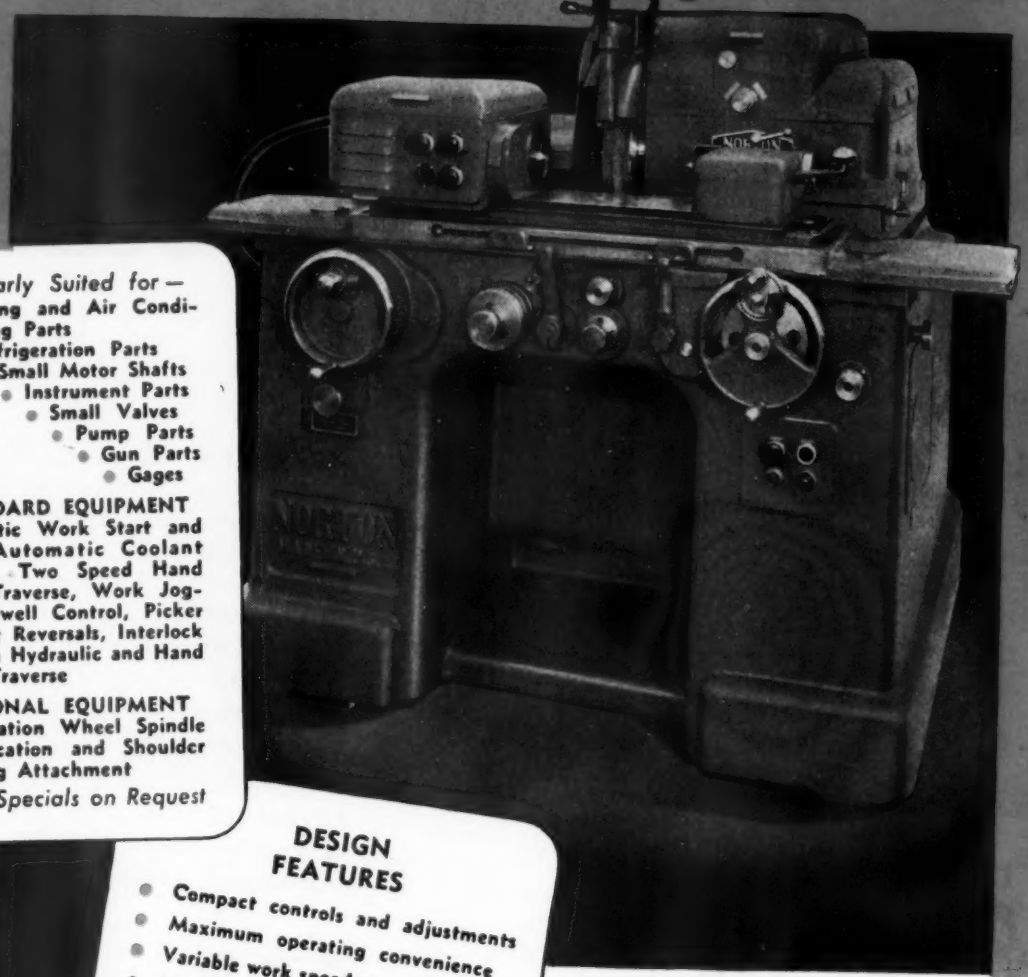
Stroke . . . . . 14"
Adjustment . . . 4"
Bed area . . 46"x84"
Strokes per minute 33
Capacity . . 130 tons

THE CLEVELAND PUNCH & SHEAR WK'S CO. U.S.A.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

The NORTON 4" TYPE C GRINDER



Particularly Suited for —

- Heating and Air Conditioning Parts
- Refrigeration Parts
- Small Motor Shafts
- Instrument Parts
- Small Valves
- Pump Parts
- Gun Parts
- Gages

STANDARD EQUIPMENT

Automatic Work Start and Stop, Automatic Coolant Control, Two Speed Hand Table Traverse, Work Jogging, Dwell Control, Picker Feed At Reversals, Interlock between Hydraulic and Hand Table Traverse

OPTIONAL EQUIPMENT

Combination Wheel Spindle Reciprocation and Shoulder Grinding Attachment

Other Specials on Request

DESIGN FEATURES

- Compact controls and adjustments
- Maximum operating convenience
- Variable work speed over wide range
- Norton tested and proved wheel spindle
- Two lengths — 12" and 18"

MACHINE ARRANGEMENTS AVAILABLE

1. Plain
2. Semi-automatic with manual control
3. Semi-automatic with automatic control

NORTON precision and dependability is made available for the grinding of small parts in the Norton 4" Type C.

Still the "baby" of the line, it has nevertheless proven unmistakably by its performance in the field that it is a worthy addition to the line of "Nortons" that form the backbone of so many of the nation's high production grinding lines.

Compact — efficient — and sturdy — it is the machine for your small parts jobs.

NORTON COMPANY, WORCESTER 6, MASS.

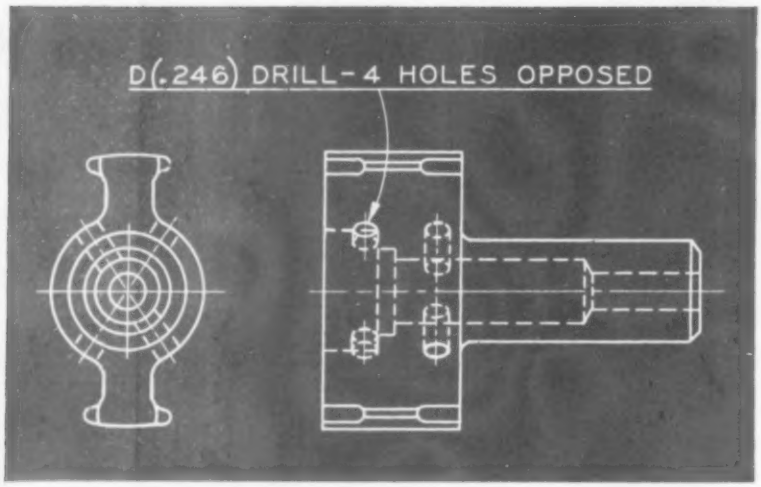
M-511

NORTON GRINDERS *and Lappers*

There are 2 ways to do this job—

1. The EXPENSIVE WAY . . . or

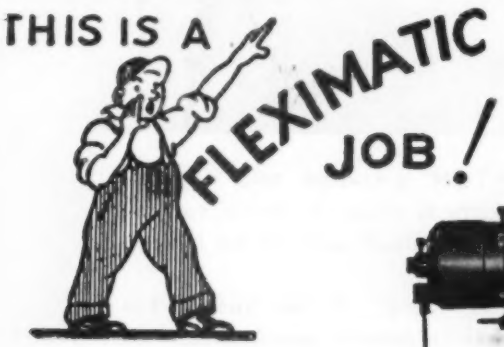
2. The FLEXIMATIC *by KINGSBURY*

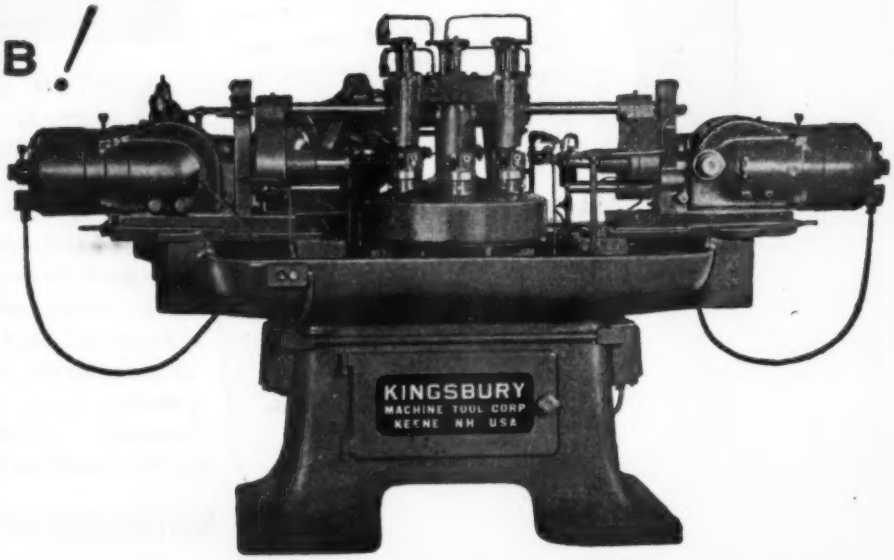


WAY

The expensive way to drill the four opposed holes in this shock absorber part would be to use a general-purpose drilling machine. Production would be limited to one hole at a time and by operator skill in manual indexing, etc. The FLEXIMATIC way uses standard Units set up on a standard base around an automatically indexing turret. The only manual operations are loading and unloading, and even as these are being performed the Units are drilling work already loaded.

FLEXIMATICS combine the speed and efficiency of a special purpose machine with the valuable advantages obtained by the flexible set-up.

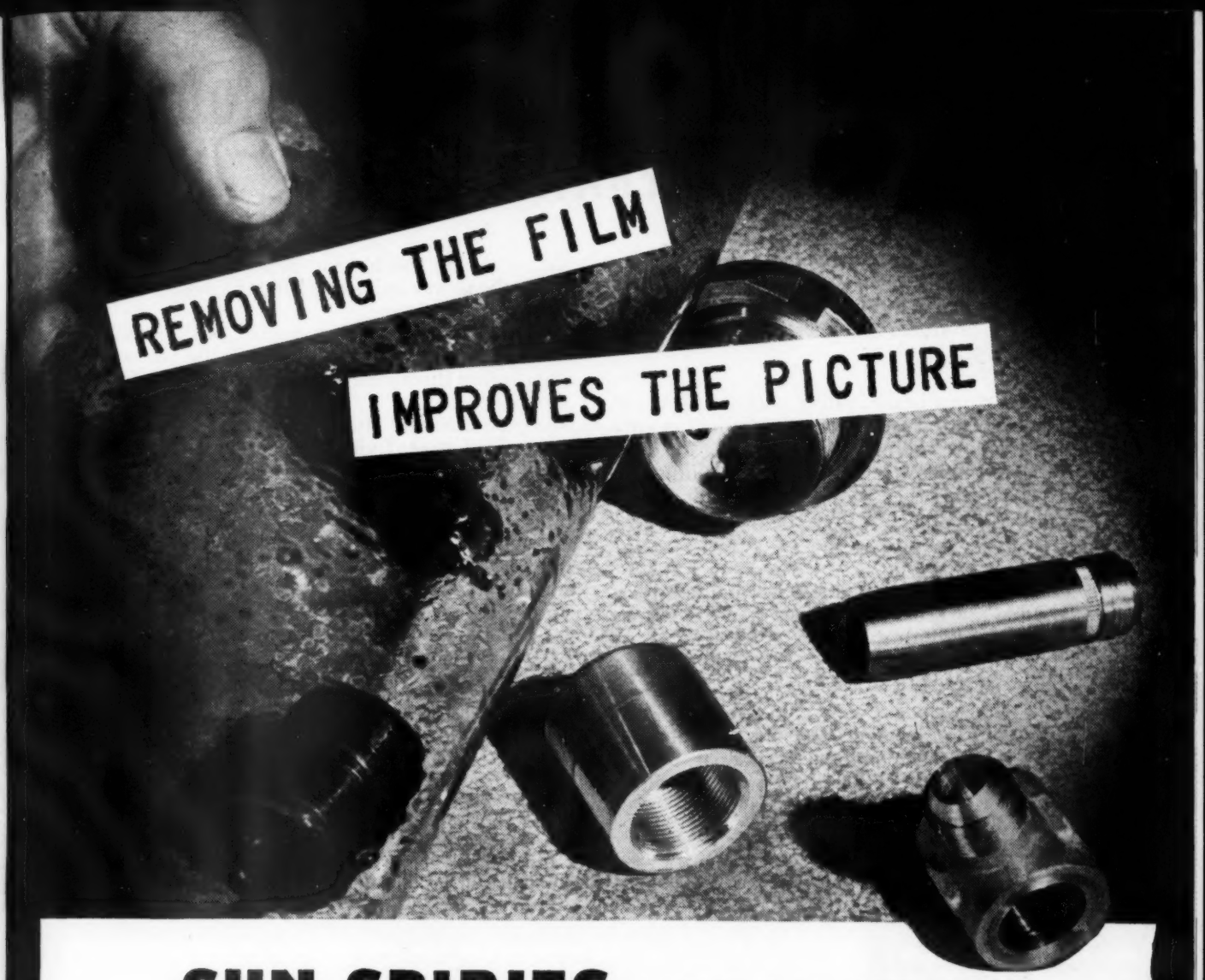




Standard Kingsbury Units for drilling, reaming, boring, spot facing and many milling operations may be mounted in any combination on standard bases and readily changed over to manufacture a wide variety of parts.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.



SUN SPIRITS... Cuts Costs 60%, Eliminates Objectionable Fumes, Improves Working Conditions

A metal-processor was dipping machined parts in a large tank, using a specially prepared chemical solvent for cleaning, before shipping.

Safety Engineers and operators objected to the fumes from the tank, and inspectors reported that an oily film still covered the parts after treatment.

A Sun Engineer was called in and recommended Sun Spirits, a product approved by the plant's Safety Department. Oily films disappeared, and, after a year of use, cleaning costs had dropped 60%.

For positive cleaning of oily and greasy films, hundreds of industrial plants rely on Sun Spirits. Sun Spirits meets specifications of fire underwriters for cleaning purposes, cleans quickly and economically. It leaves no spots. For help on metal-cleaning problems, call the Sun Engineer near you. Or write . . .

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

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SUNOCO **SUN INDUSTRIAL PRODUCTS**

OILS FOR AMERICAN INDUSTRY

Snyder Special runs 375 PIECES HOURLY ON 12-OPERATION CYCLE

Performing 12 successive operations upon a brass sprinkler head body, this two-way horizontal machine, designed and built by Snyder, produces 375 parts an hour at 80% efficiency.

The part is a brass casting without previous machining and operations are drilling, reaming, hollow milling and threading on one end, and, hollow milling, facing, drilling and tapping the other end, plus assembling and spinning in place a pressed metal deflector of which there are three sizes and shapes.

The work-piece is loaded manually into a double-jaw screw chuck actuated in loading position by hydraulic cylinders. Six of these fixtures are mounted on a trunnion which is indexed 60° station to station.

Each station has separate slide and spindle motor and each spindle has separate hydraulic control. Hydraulic power for slides and clamping mechanism is supplied by a hydraulic power unit set behind the machine.

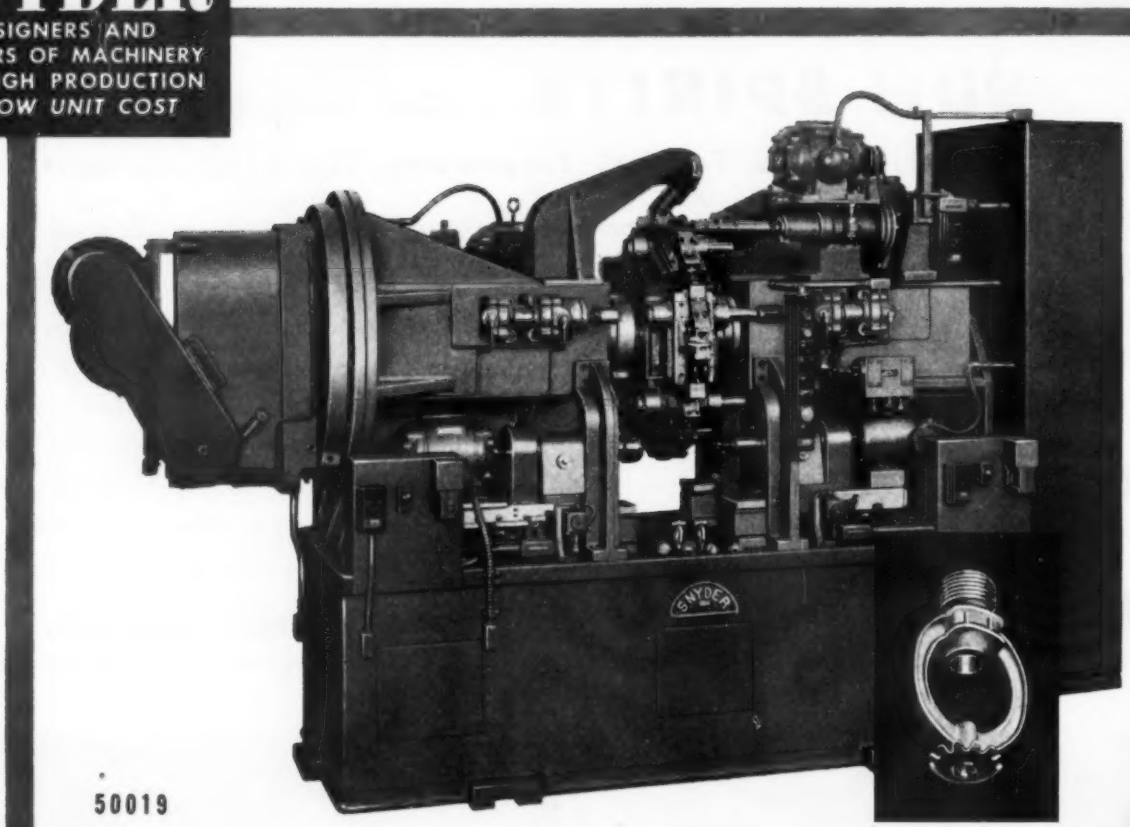
The index mechanism is mounted at the left end of the machines and keyed to the trunnion fixture through a heavy trunnion shaft.

Machine base and trunnion bearing housing are welded steel. Index mechanism housing and hydraulic slide bases are cast iron. Slides are hardened and ground steel. Because operations are on brass, no coolant is provided.

The economies of this type of machine include reduced handling and operator fatigue, accurate control of precision, finish and time cycle, use of unskilled help, increased safety. Is your production department equipped with modern, time-saving, cost-reducing production units? Perhaps Snyder can help you too. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Cooperation with Leading American Industries



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MODEL C *Milwaukee*

AUTOMETRIC BORING MACHINE

Advanced in every detail the Model C Autometric Boring Machine offers initial high accuracy — design and construction to sustain this initial high accuracy through out a long productive life — unexcelled simplicity, ease and convenience of operation.

Note these "shop-tested" features:

- Column, bed and chip guard cast in one sturdy unit — integral design.
- Rugged, compact, balanced construction with exceptionally low center of gravity — minimum vibration.
- Hardened, ground, and lapped quill, saddle and table ways — for sustained accuracy.
- Large diameter quill with extra long bearing, sliding in a fixed headstock, provides the total range of vertical movement — fewer moving parts.
- Direct measuring by Precision Screw Locating results in faster operation—with no loose pieces to handle
- Rapid traverse to spindle quill is instantly available — speed and ease of operation.
- Greater Speed and Feed Range — infinitely adjustable spindle speeds from 50 to 2500 rpm; 8 borin feeds .0005" to .0148" per revolution of spindle.

Your precision boring costs can be reduced — complete information on the Model C Milwa Autometric — write for Catalog No. CMA10.

KEARNEY & TRECKER

Products

CORPORATION WISCONSIN

Subsidiary of Kearney & Trecker Corporation

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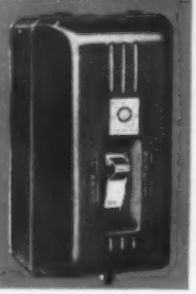
Pick this enclosure... ..for this manual motor starting job

....get these Westinghouse Starter features!

NEMA Type I

STANDARD SHEET STEEL ENCLOSURE



General-Purpose Indoor Applications —normal atmospheric conditions

"DE-ION" MOTOR WATCHMAN 10-100-S

NEMA Types III, IV & V

WATERTIGHT AND DUST-TIGHT CAST-IRON ENCLOSURES

(Rubber gasket between case and cover)

Outdoor applications including:

- Docks
- Canal locks
- Subways
- Tunnels

Indoor applications including:

- Dairies
- Breweries
- Steel mills
- Cement mills
- Woodworking plants

"DE-ION" MOTOR WATCHMAN 10-100-W

NEMA Types VII & IX

CAST-IRON ENCLOSURE FOR HAZARDOUS LOCATIONS

Class I, Group D and Class II, Groups E, F & G (Ground flanges on case and cover)

- Refineries
- Distilleries
- Varnish plants
- Flour mills
- Grain elevators
- Sugar, cocoa, coal pulverizing plants
- Aluminum and magnesium processing plants

"DE-ION" MOTOR WATCHMAN 10-100-U

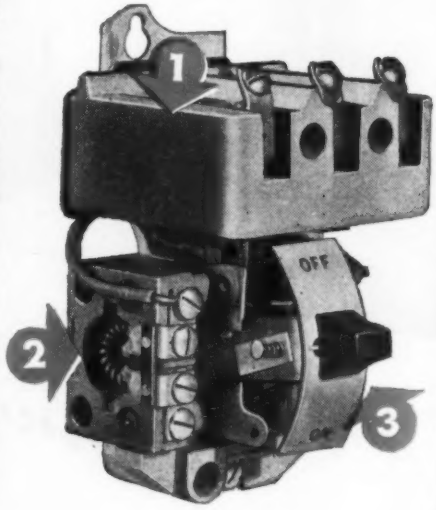
NEMA Type I—S

FLUSH-MOUNTED SHEET STEEL ENCLOSURE

Same applications as standard sheet steel enclosures—where flush mounting is desired.

"DE-ION" MOTOR WATCHMAN 10-100-P

1. **"De-ion" Arc Quenchers.** Arcs go out *quick*, making contacts last longer.
2. **Bi-Metal Overload Relay.** Accurate calibration for life of starter. Permits harmless overloads—protects motor against dangerous running overloads or stalled rotor conditions.
3. **Quick-Make, Quick-Break Action.** Prevents teasing, prolongs contact life.



See your Westinghouse Distributor for full details or write for D. B. 10-100. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-60614

Westinghouse MOTOR CONTROL

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

An Important Statement of Policy

FOR years, Warner & Swasey has taken the position that its responsibility does not end with the delivery of a Warner & Swasey machine. We will continue this policy throughout this period when many government-owned surplus Warner & Swasey Turret Lathes are passing through many hands.

Besides the obligation we owe a Warner & Swasey owner, wherever he may be, we also have a deep interest in a sound, efficient, postwar national economy. It is our belief that low-cost high-production is vital to such an economy—and that means using the most efficient methods and tools available.

Warner & Swasey Maintains Records of Every Warner & Swasey Machine in Service

Given model and serial number, your nearest Warner & Swasey Branch Office can tell you *when* the machine went into service, *what special specifications* were involved—*what original equipment,* accessories and tools were included. They can aid you further by giving you a report. Knowing the jobs you expect to use these turret lathes on will enable them to advise you whether the machine will serve you capably, or whether it would handicap your future production when compared to other possibilities for doing your job better.

SEND FOR FREE COPY

The "Buyers Guide" will prove a valuable aid in helping you determine the proper Warner & Swasey Turret Lathe to suit your needs in the purchase of surplus turret lathes. To get a copy, just write to us here in Cleveland or contact your nearest Warner & Swasey Branch Office.

You can Machine it Better, Faster, for Less... with a Warner & Swasey

WARNER & SWASEY
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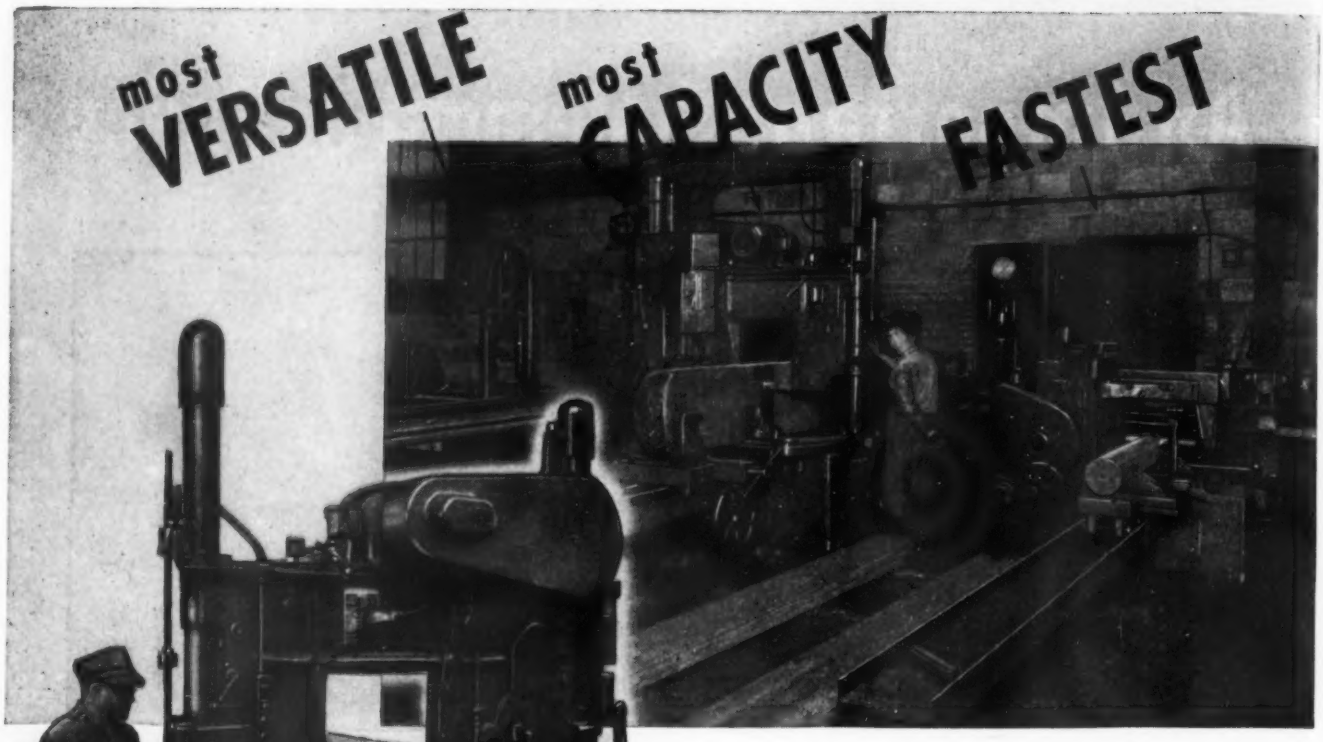
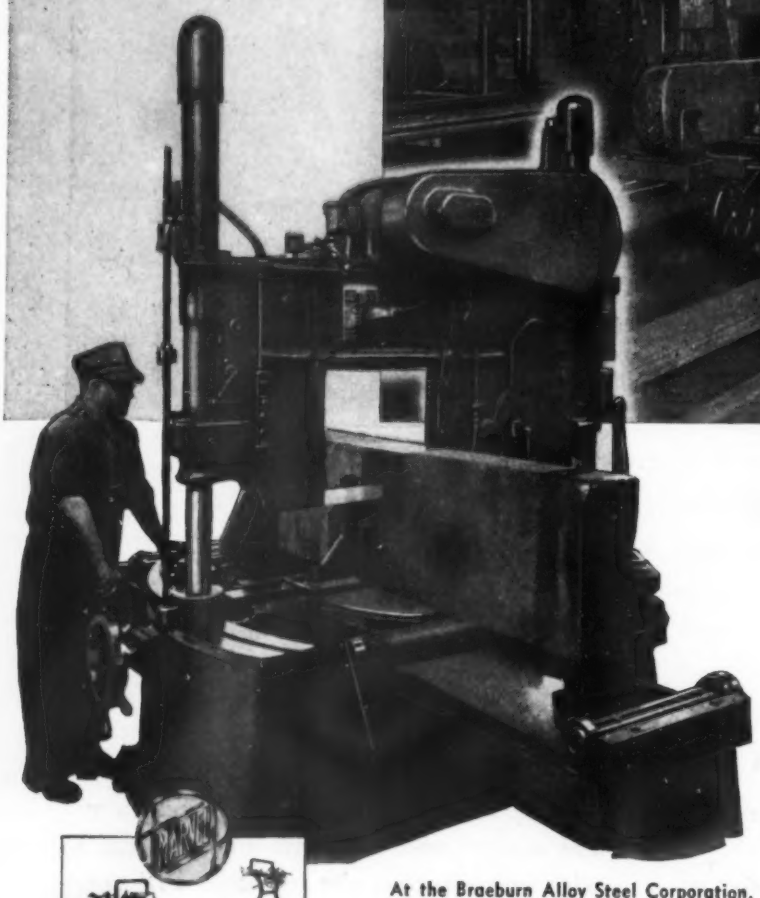
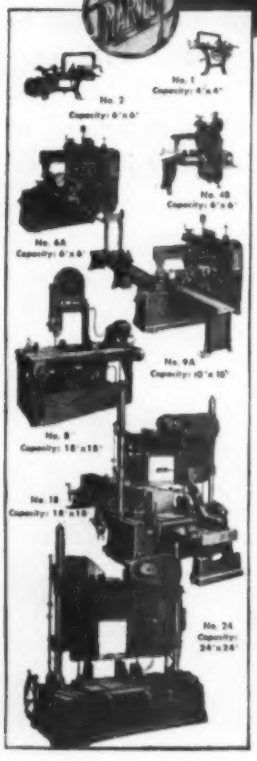
TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—PRECISION TAPPING AND THREADING MACHINES

most VERSATILE most CAPACITY FASTEST





EACH *first* IN ITS CLASS



At the Braeburn Alloy Steel Corporation, Braeburn, Pennsylvania, there is a lot of steel to be cut—not only in tonnage but in types of steels, variety of cuts and range of sizes. Still the Braeburn Corporation can give prompt cutting-off service on any order, whether it be for a single tool steel flat, a thousand gear blanks or a giant die block (up to 18" x 18" cross section). They have equipped their cutting-off department to handle every type cutting-off job with a MARVEL No. 8 Metal-cutting Band Saw, by far the most versatile saw built; a MARVEL No. 9A Automatic Production Saw, by far the fastest saw; and a MARVEL No. 18 Giant Hydraulic Saw—which, with the exception of its larger "sister" the MARVEL No. 24 (capacity 24" x 24"), is the largest capacity hack saw built. With this battery of modern sawing equipment this firm gets the utmost in Speed, Accuracy and Economy, no matter what the job calls for. Furthermore, because of the automatic features of these saws, one operator takes care of all 3 of them.

No matter what your sawing needs, from the most inexpensive dry cutting shop saw to the largest capacity giant, there is a MARVEL Saw exactly suited to your needs and it's the best saw of its type.

For quick reference see our section in Sweet's File—Mechanical Industries, or write for catalog

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. **Chicago 39, U. S. A.**

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

FASTER SPEEDS HEAVIER FEEDS ... THE ORDER OF THE DAY

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental CUTTING TOOLS

Boring Bars and Tools
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Broaches
Broach Pullers
Broaching Fixtures
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Core Drills
•
Counterbores
and Countersinks
•
CTW Drive Holders
•
Counterbores
(Tool Room Sets)
•
Counterbore Pilots
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Inserted Blade Cutters
•
Carbide Tipped Cutters
•
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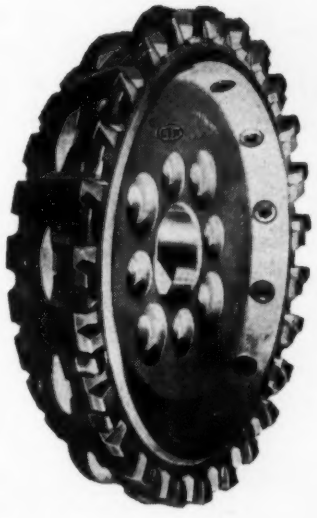
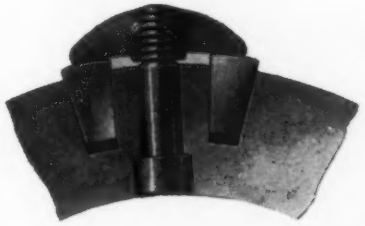
•
Milling Cutters
•
Thread Milling Cutters
•
End Mills
•
Side Mills
•
High Speed Steel
Reamers
•
Carbide Tipped Reamers
•
Shell Reamers
•
Inverted Spotfacers
•
High Speed Steel
Tool Bits
•
Carbide Tipped
Tool Bits
•
Circular Form Tools
•
Cut-off Tools
•
Flat Form Tools
•
Dovetail Form Tools

45-59

Continental Type "R" Face Milling Cutters Have Many Superior Features

. . . for positive or negative rake milling . . . with removable blades (carbide-tipped, high speed steel, or cast alloy) . . . rugged body construction with simple yet ingenious positive blade lock that utilizes amplified forces . . . has advantage of blade adjustment into infinite increments . . . no special tools required to re-set blades . . . Continental Cutter can be readily modified to suit varying operating conditions. Wide range of sizes.





Note simplicity of Continental clamp, each clamp securely locking two blades. Ample clearance at the bottom of each slot insures perfect seat for blades.

Continental Cutter body is hardened to prevent mutilation and wear. There are no screw threads in the cutter body to wear out, strip, or become plugged with broken screws. Send for Bulletin M-338.

CONTINENTAL TOOL WORKS
Division of Ex-Cell-O Corporation
DETROIT 6, MICHIGAN

ANOTHER EXCLUSIVE HYPRO FEATURE

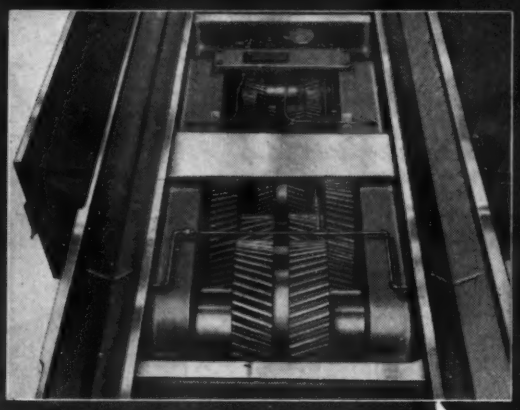
Complete Herringbone Twin Gear Table Drive

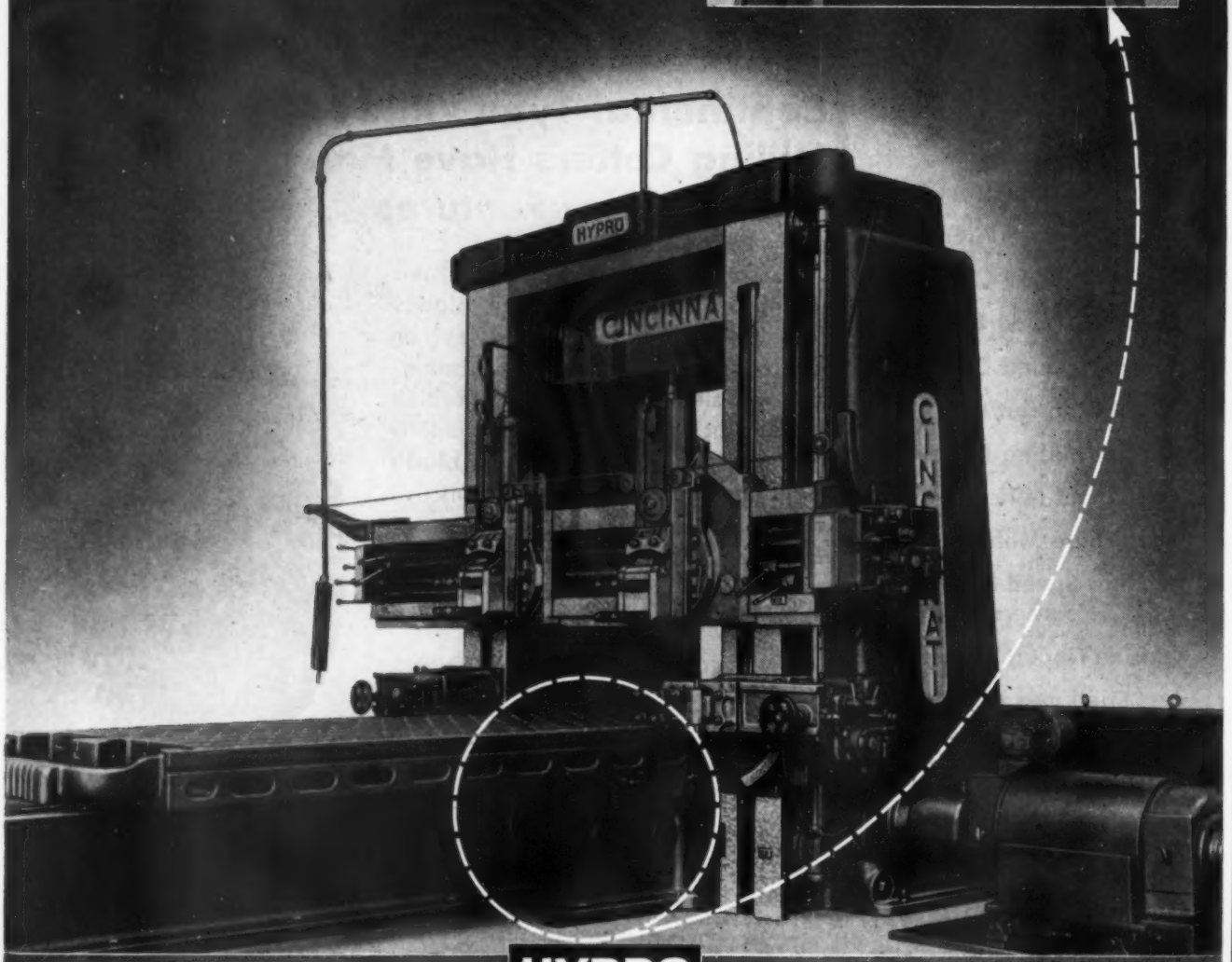
In no other planer will you find the complete steel herringbone twin gear table drive.

The twin gear train, including the bull wheel and rack, is of the herringbone type. This construction gives a smooth, continuous and even flow of power through greater tooth surface and eliminates side thrust.

There is no shock when the load is transferred from tooth to tooth, eliminating practically all wear. The gears work silently and without vibration on their large diameter shafts which are hardened full length and ground at the journals. All gears and pinions are made of steel and flame hardened.

This is one of those exclusive features that make the Cincinnati Hypro a buyer's choice.





THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

For line reaming holes to exact uniformity, the Staples Expansion Piloted Reamer was used in hole finishing many of the famous engines which powered our great bombing fleets. Equal accuracy in line reaming is required for many of today's peacetime products. Expansion of this reamer is simple and accurate. Just drive the shell up on the tapered arbor. The shell is in one piece; no screws to adjust; no regrinding after expansion. These exclusive Staples features save time, prolong tool life, assure precision accuracy.

The high efficiency, the time and cost saving features of Staples' complete line of Carboloy-tipped circular cutting tools, will help you maintain the production standards essential in meeting peacetime competition. Our standard line is available from stock. Special cutting tools made to your specification. Catalog and complete information sent promptly upon request.

Staples Tool & Engineering Company

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Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

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Because a spark would make things go BOOM

...FUEL HOSES HAVE

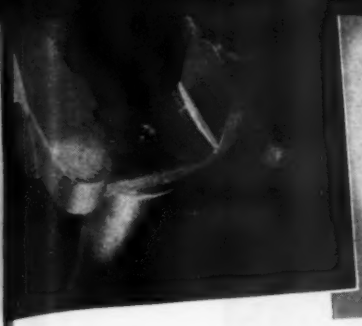
"Alcoa Aluminum Armor"

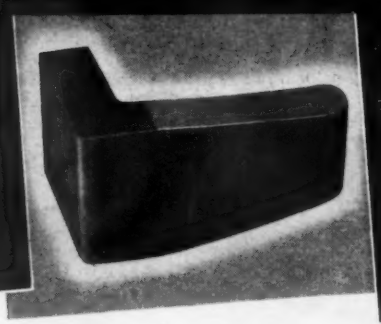
Non-sparking Alcoa Aluminum armored hose can be safely dropped or dragged on steel boat decks or docks. No sparks, no "booms" where highly volatile gasolines and naphthas are being pumped.

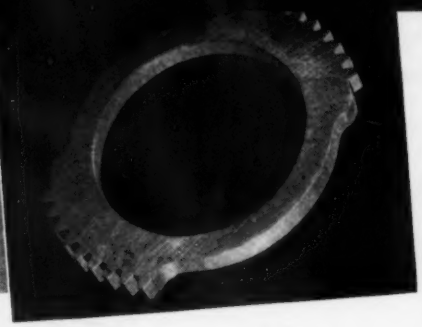
Light weight, flexibility, durability, resistance to corrosion, and ability to withstand hydrostatic pressures . . . these are the other requirements of fueling hoses readily met by Alcoa Aluminum armoring.

Do all these properties of Alcoa Aluminum wire and rod, plus being non-magnetic and having high electrical conductivity, suggest an application in your products? Alcoa engineers will gladly give you the benefit of their experience in determining the facts. Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

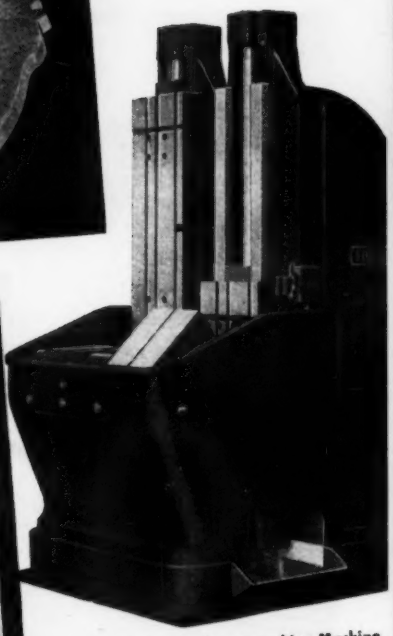
ALCOA FIRST IN ALUMINUM



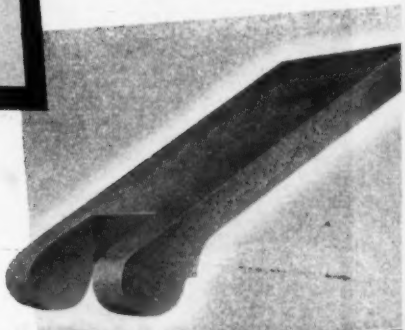


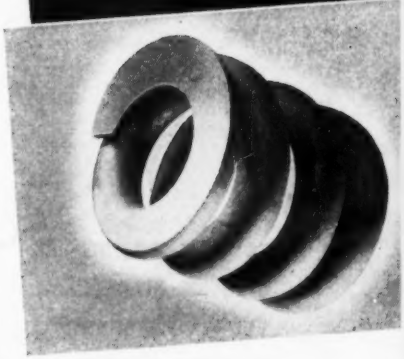


A WIDE VARIETY OF *Surface Broaching* CUTS



25-Ton Duplex Surface Broaching Machine



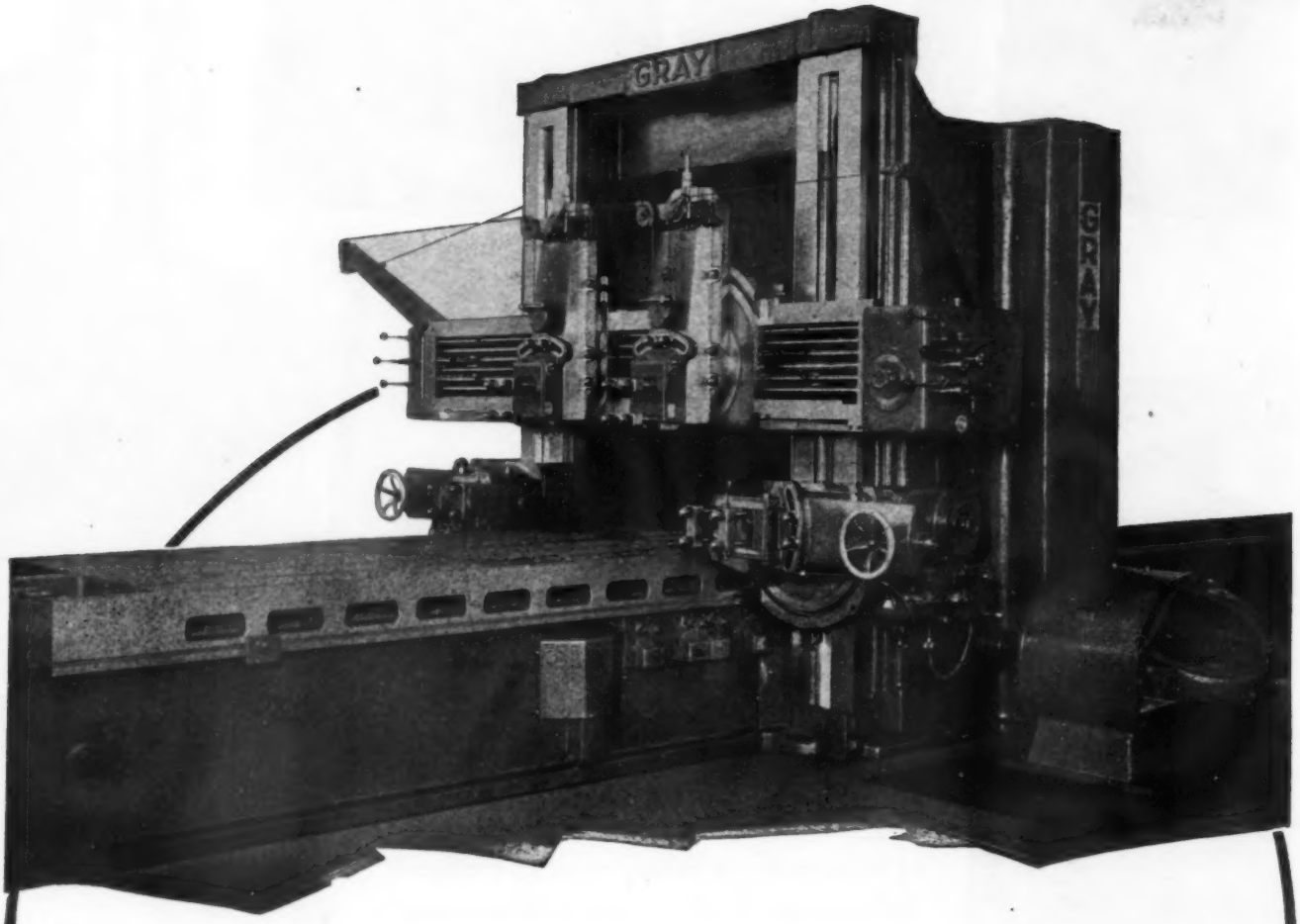


★ Here are just a few of the types of cuts that are being used in surface broaching to show remarkable saving on contracts. Many jobs that were slow and expensive when handled by conventional machining methods are now being surface broached faster and cheaper on Footburt machines. Production in most cases is as fast as the speed at which parts can be loaded, yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you. Send your blueprints and production requirements.

THE FOOTE-BURT COMPANY
CLEVELAND 8, OHIO
Detroit Office: General Motors Building

Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*



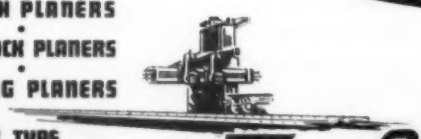
GRAY PLANERS build operator confidence

For example: The GRAY RAIL LOCK requires no adjustment. Year in—year out, it grips both housings with equal force. The operator can use the largest feeds and the highest speeds that the work and the tools will stand, for he knows that his rail is always rigidly locked to both housings.

•

Write for Bulletin 40-R. Our engineering department will furnish any additional information you desire.

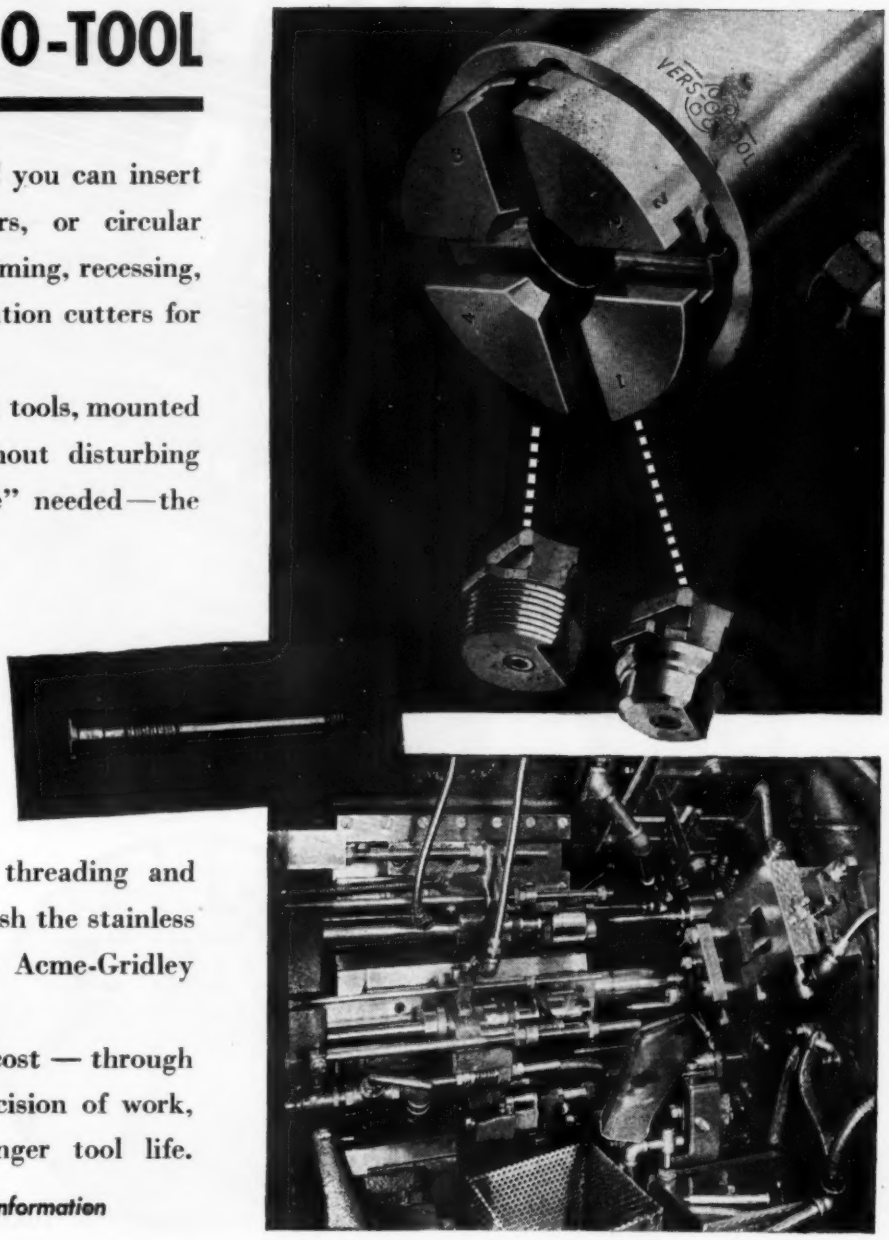
DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES



The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

How you can CUT COSTS with the VERS-O-TOOL



Into the *same* self-opening *head* you can insert ground thread circular chasers, or circular cutters, for end turning, end forming, recessing, knurling, burnishing or combination cutters for threading and forming.

Then you can insert reground tools, mounted on blocks, in *one minute*, without disturbing the setup. No "trying for size" needed—the first piece is production.

And finally, ground thread circular chasers and circular cutters last 10 to 50 times longer — they may be reground through 270° circumference.

Three Vers-o-tools—two for threading and one for forming—are used to finish the stainless steel valve stem shown, on an Acme-Gridley Bar Automatic.

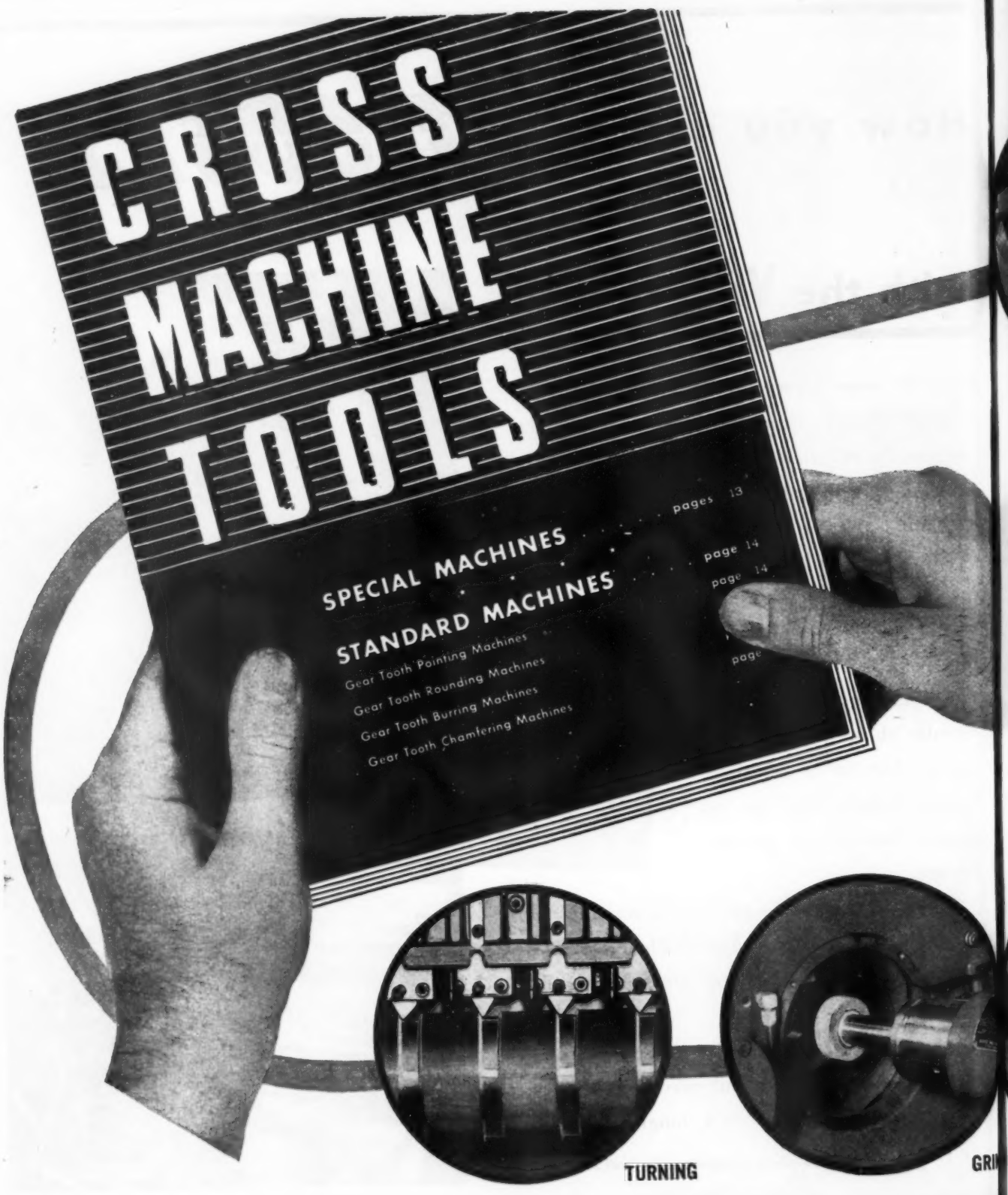
Job produced at new low cost — through money saved on speed and precision of work, lower tool investment and longer tool life.

Catalog C-42-B gives complete information

The NATIONAL ACME CO.

170 EAST 131st STREET · CLEVELAND 8, OHIO

COLLETS AND PUSHERS
The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.
Bulletin CP-45



S-25

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MILLING

MILLING FORM

GEAR CHAMFERING

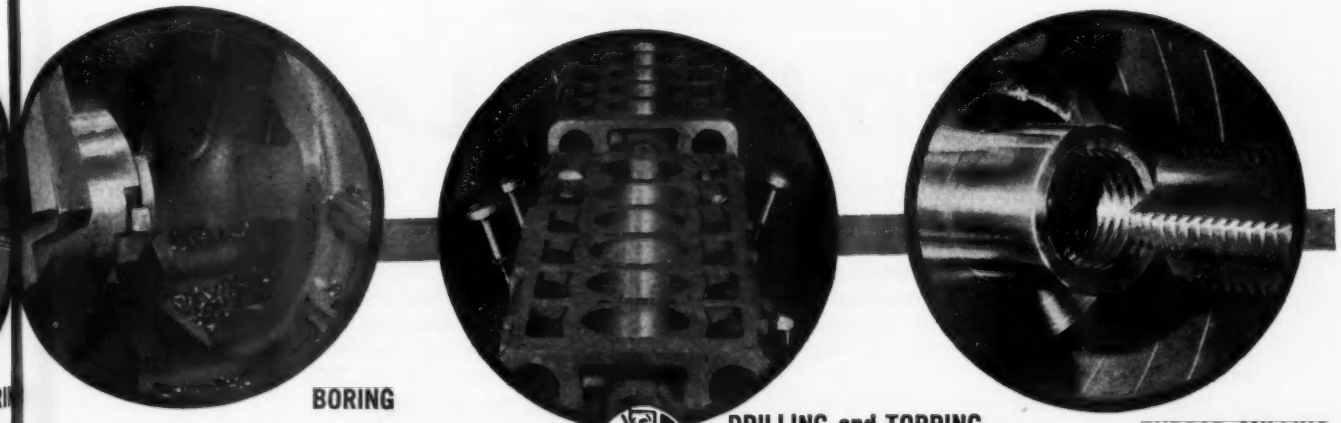
Custom Built for OPERATING EFFICIENCY

Combined metal removal operations—performed simultaneously or in programmed sequence—and at the push of a button.

That is the story of Cross Special Machinery told in this book. Tools built around a part's machining requirements rather than a part adapted to the limitations of a series of single-purpose tools.

Results: A tremendous increase in output per man hour. Assured uniform precision. A fraction of the machine tool investment. A greatly reduced part cost.

Send for your copy of this book. See what we have done for others—and can do for you, in reducing costs and increasing efficiency with Cross Special Machines. THE CROSS COMPANY, Detroit 7, Michigan, Dept. 171.



BORING

DRILLING and TOPPING

THREAD MILLING

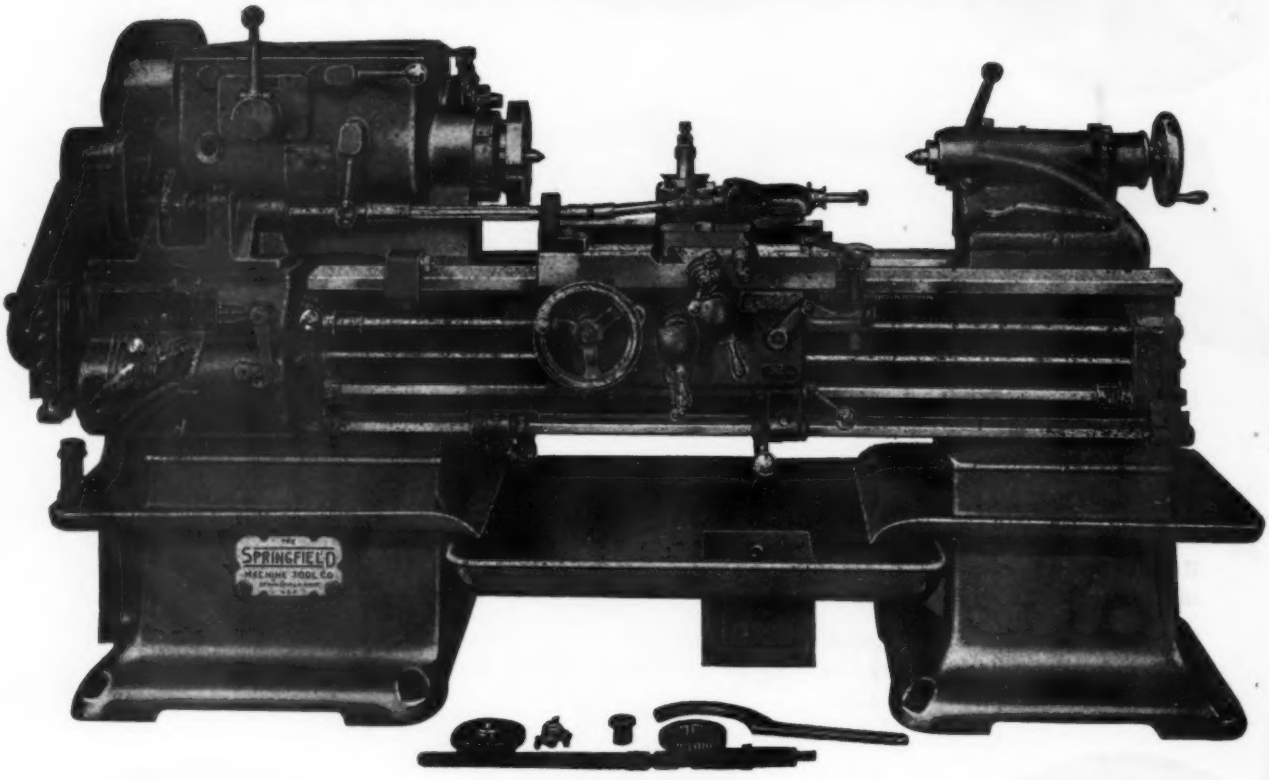
SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

Choose

SPRINGFIELD



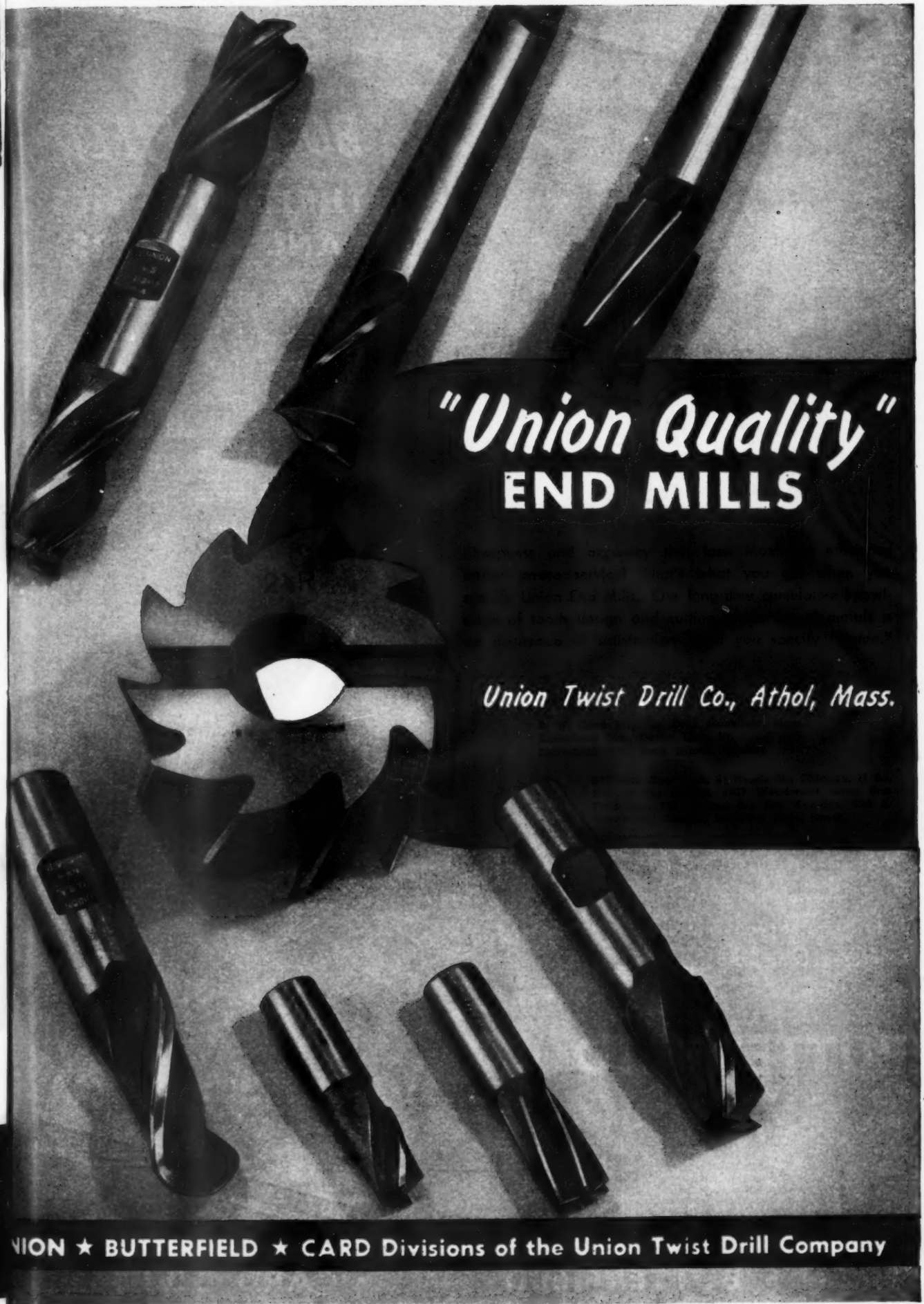
GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own foundry . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL *Co.*

SPRINGFIELD OHIO U.S.A.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END MILLS
Union Twist Drill Co., Athol, Mass.
NION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

BUTTERFIELD

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THRED-RITE Adjustable Collet Dies and Holders, are economical, fast, accurate! Top-quality results are assured. Carbon steel and high speed steel. NC and NF threads. All standard sizes.

These Butterfield Tools are made of the finest carbon steels and high speed steels – available in a complete range of types and sizes. Accurate! Long-lived! Dependable!

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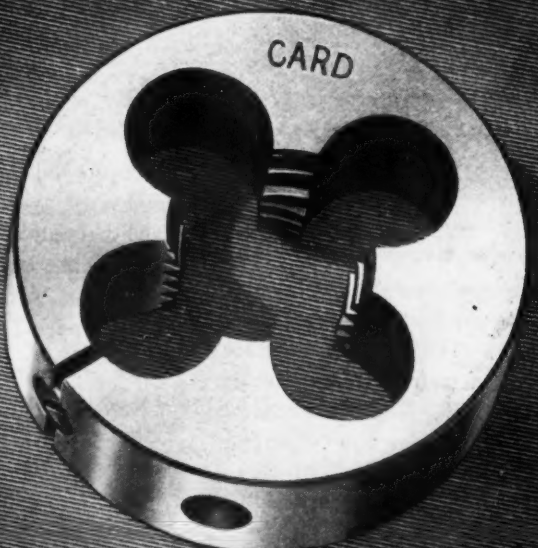
—and in all styles! Choose your Taps for greatest peacetime production from the complete line made by the Card organization of tap experts.

Round DIES

Card Adjustable Round Split Dies are carefully produced of hardened tool steel, adjustable by the simple use of a taper screw . . . can be removed from holder without losing size.



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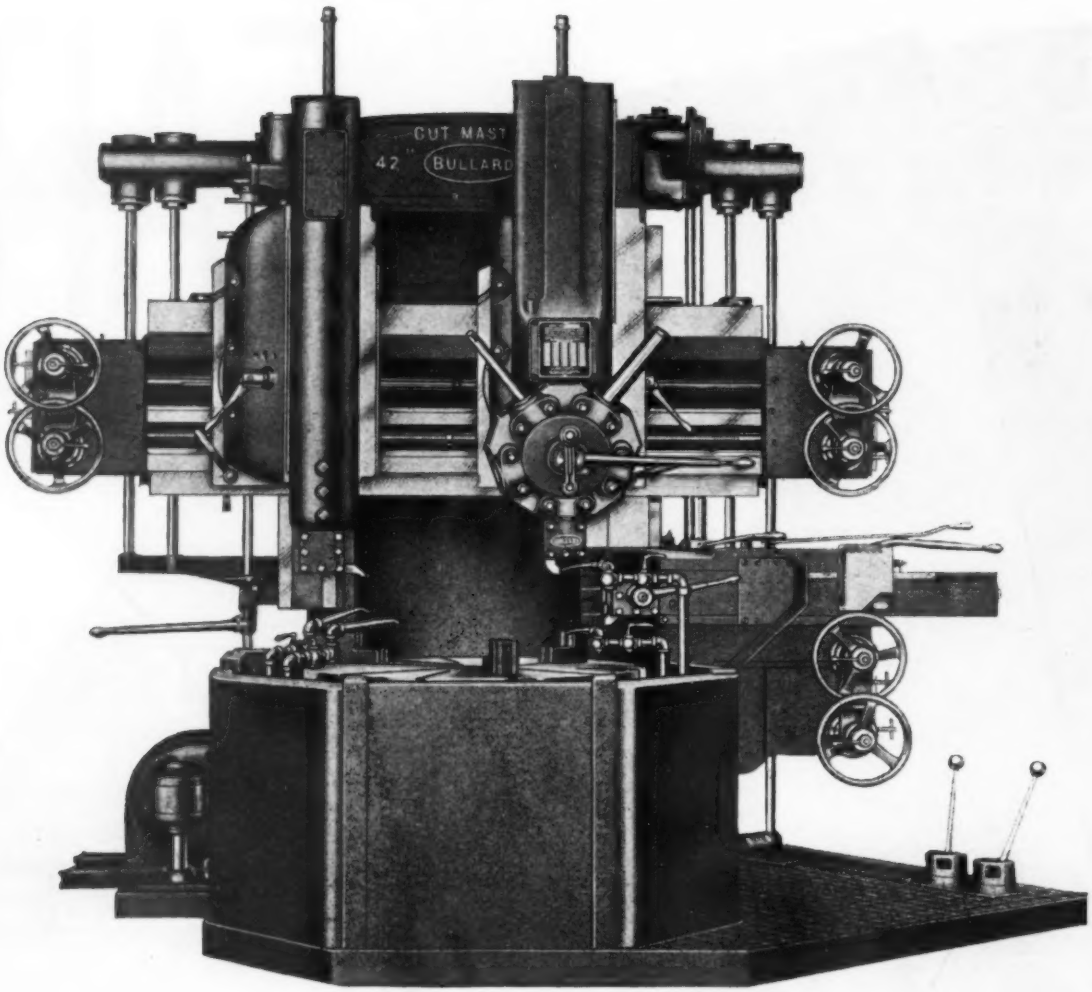


ONLY BULLARD CUT MASTERS HAVE ALL THESE COST-CUTTING FEATURES

Features that Cut Time on Cuts

1. On five sizes, 30″ up to and including 64″, the base and upright column is a massive integral casting for vibration-free sturdiness and rigidity. This permits heavy, accurate cutting. **2.** Swiveling main turret head and independent, non-swiveling side head for simultaneous heavy cutting without interference or lost time. **3.** Sixteen feeds for each head in geometrical progression from .0026 to .500 per spindle revolution . . . 20 table speeds . . . motor ratings 30 to 40 HP — *all* adequate for fast heavy cutting. **4.** Screw feed of main head for highest degree of machining accuracy under heavy feeds. **5.** The ideal combination of rigidity, sturdiness, freedom from vibration, smooth flow of power and wide range of speeds and feeds to take full advantage of the higher efficiency of the latest development in cutting tools.

Features that Cut Time between Cuts

6. Vertical construction that speeds chucking because it is easier to lay a piece down than to hang it up. **7.** Chucks designed to provide maximum jaw pressure with minimum wrench effort. **8.** Quick, easy adjustment of main rail to place turret close to work and eliminate excessive tool overhang. **9.** Rapid power traverse in any direction, accurately controlled to bring tools quickly, safely within a fraction of an inch of the work.

Compare Bullard Cut Master Vertical Turret Lathes' efficiency and economy with other machines of the same type. You'll find that only a Cut Master has the metal-removing ability and *all* the other features that *cut time on and between cuts* to the minimum. Cut Masters are available in 30″, 36″, 42″, 54″, 64″, and 74″ sizes. The Bullard Company, Bridgeport 2, Connecticut.

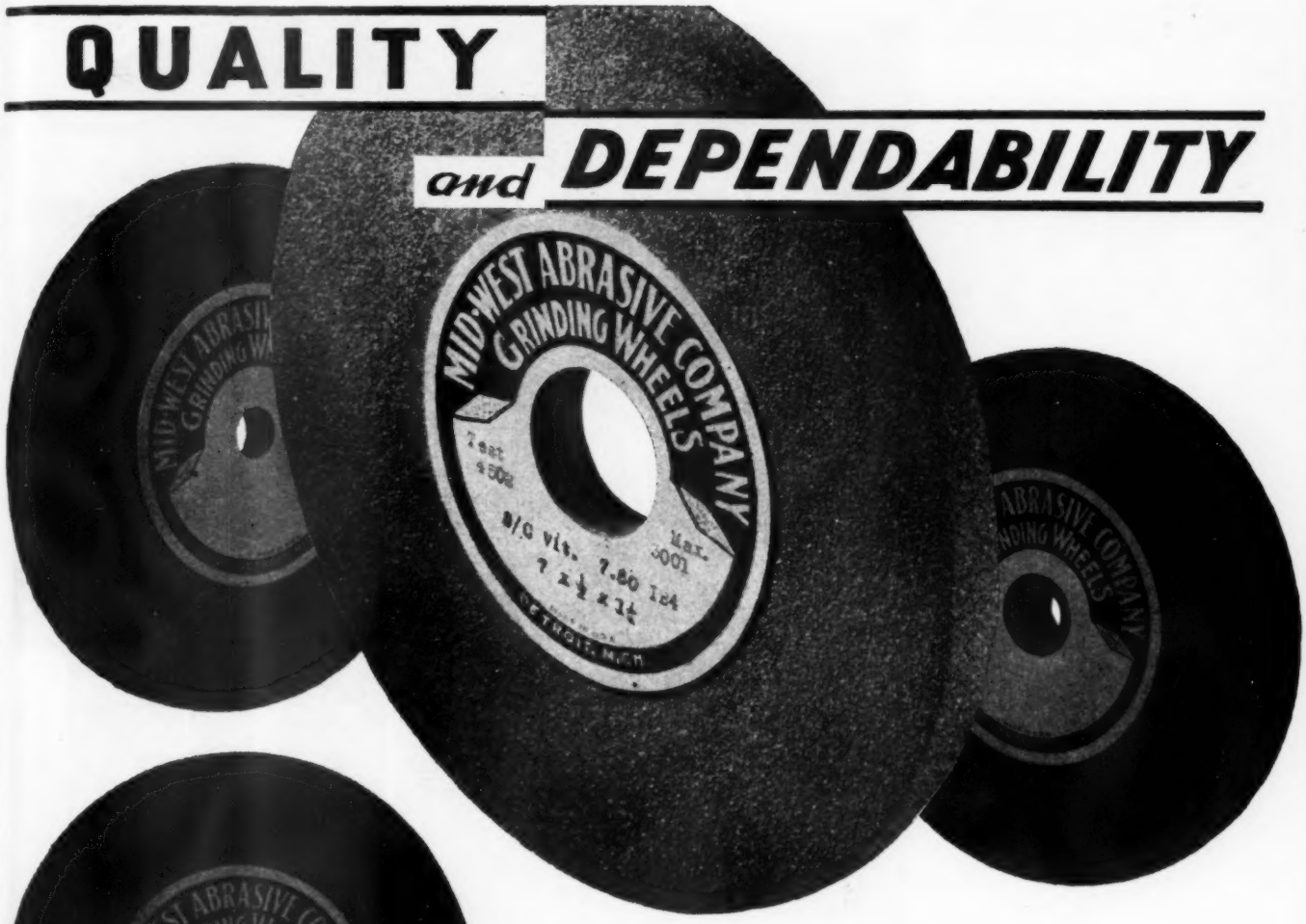
From Government Machine Tool Surplus Lists, select the better machines to replace obsolete models you've been using on non-critical work. Ask Bullard for information on your selection of government surplus machines by machine serial number.

BULLARD

CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE

QUALITY and DEPENDABILITY



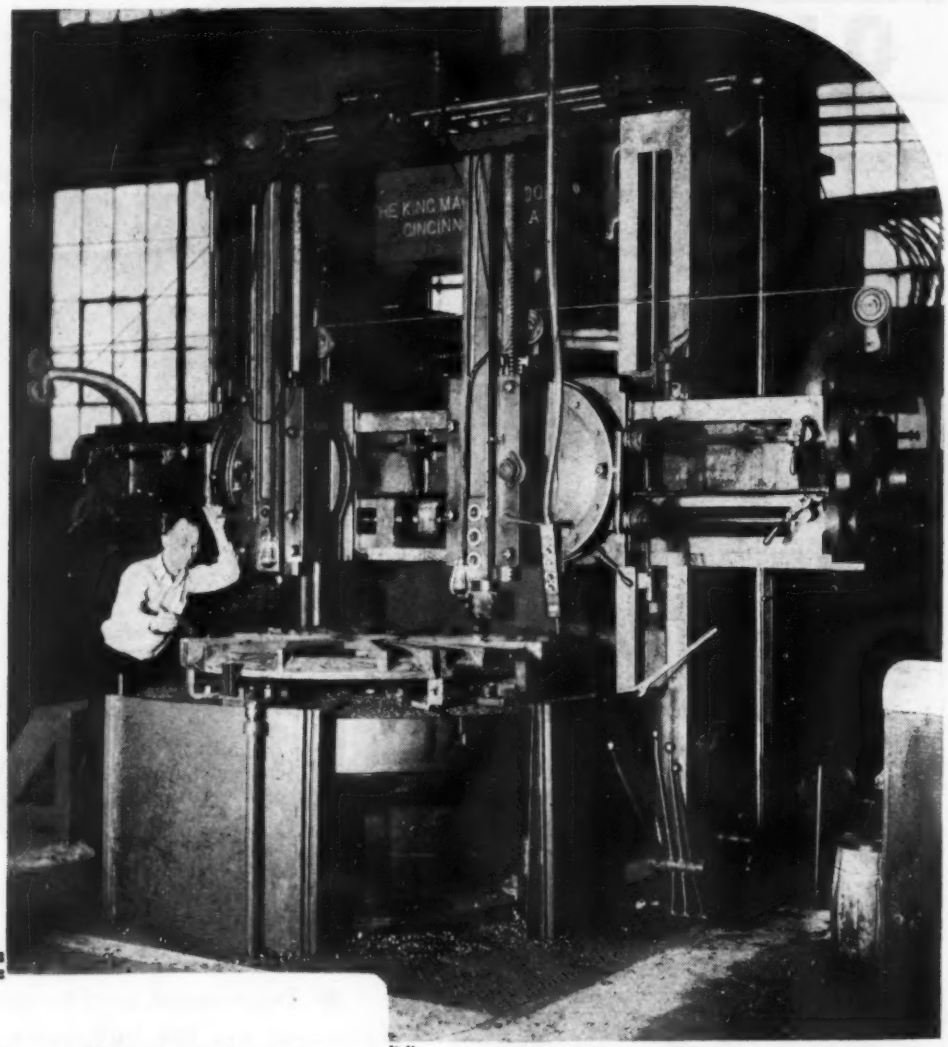
● Engineered quality and dependability of performance are the hallmarks of products of the Mid-West Abrasive Company.

Mid-West's outstandingly successful tool room grinding wheel, and every other product of the broad Mid-West line—honing stones, sharpening stones, coated abrasives, disks and wheel dressers—all must bear these two hallmarks.

Let quality and dependability guide you in your choice of abrasives, and we feel certain that choice will be Mid-West. Prompt delivery on all items.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives · Owosso, Mich. · Detroit · Rochester, Pa.



● Reconversion presents no serious problems on work requiring boring—turning—facing and similar operations when you have a King Vertical Boring and Turning Machine.

King offers those advantages of heavy construction and rigidity that permit the use of special alloy steel tools—greater speeds, heavier feeds and results in high production and dependable accuracy.

Thus as we move into a period when costs take a more and more important part in production it will be to your advantage to consult a King representative on your precision boring—facing—and turning operations.

KING BUILDS Vertical Boring and Turning Machines exclusively—single column types from 30" to 42—double column types from 52" to 12 feet.

Turning for War
or Turning for Peace

YOU CAN DO THE JOB BETTER, FASTER AT LOWER COST

with a

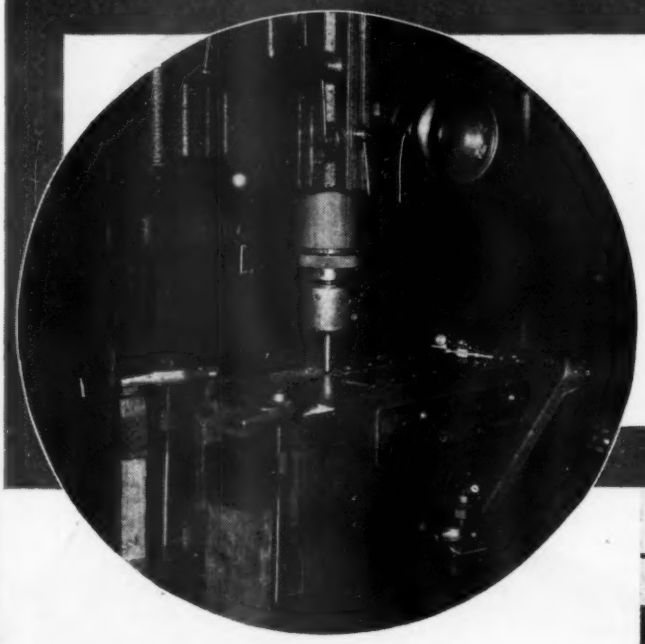
KING

VERTICAL BORING
and **TURNING MACHINE**

THE KING MACHINE TOOL COMPANY

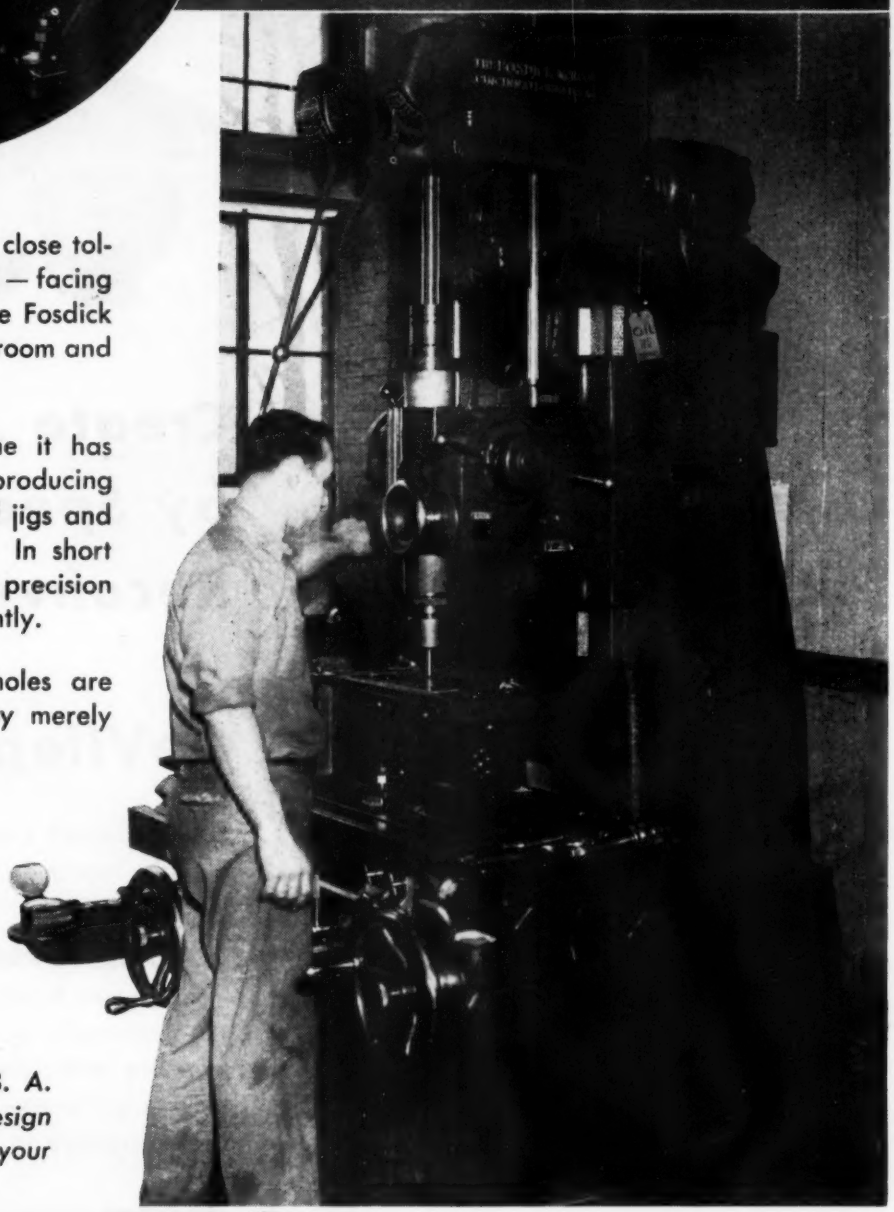
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY



MEETS RIGID TOLERANCES
AND MAINTAINS THEM

FOSDICK
JIG BORERS



● Designed and built to meet close tolerances on boring — reaming — facing and light milling operations the Fosdick Jig Borer is ideal for both tool room and tool and die shop work.

For a medium priced machine it has proved most economical in producing small lots on which the cost of jigs and fixtures would be prohibitive. In short it is a "natural" for producing precision work inexpensively and efficiently.

On the job shown several holes are within reach of the spindle by merely moving the table to desired position with the handwheel.

If your work requires precision boring — reaming — facing and similar operations put it on a Fosdick Jig Borer for accuracy and low cost production.

Fosdick Jig Borer Bulletin J. B. A. contains complete details of design and construction. Write for your copy today.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

He wants a JOB
. . . and fast!

The world's finest BORING and milling machine.

WRITE TODAY for your descriptive bulletin.

Create Jobs Faster by Speeding up your Reconversion Tooling

with a

DeVlieg JIGMIL

USERS report two to three times the output with greatly improved accuracy as compared to other methods.

AUTOMATIC PRECISION . . . Automatic positioning between holes is controlled within less than one ten-thousandth part of an inch . . . feather touch pressure controlled slide locks positively control locking uniformity after positioning . . . all functions are responsive to the centralized finger tip control.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

HIGH PRECISION

HIGH PRECISION as achieved by SIP is again available to American Industry with excellent deliveries on all size Jig Borers and other famous SIP equipment.

Since 1862 SOCIÉTÉ GENEVOISE D'INSTRUMENTS DE PHYSIQUE of Geneva, Switzerland, has been the recognized leader in the manufacture of some of the world's most accurate machines, measuring and dividing equipment.

Over two thousand SIP Jig Borers of different sizes are in use all over the world and the newest model, the HYDROPTIC-B, here shown, embodies improvements that are greatly desired by progressive manufacturers.

THE HYDROPTIC–B

- Performs MILLING AS WELL AS BORING with an equal degree of precision.
- Maintains PERMANENCE OF ACCURACY in spite of heavy mechanical stresses and strains.
- Gives HIGH EFFICIENCY, over a large range of speeds and feeds.
- Performs every operation through automatic movements and convenient location of controls.
- Can be used as a measuring instrument.

The HYDROPTIC-B has no lead screws but is equipped with an optical measuring system which consists of a standard scale and microscope of extreme precision whose accuracy is unquestioned.

This Jig Borer and Milling Machine is equipped with a hydraulic table drive which permits rapid traverse of the table over its full stroke in one half minute.

While the machine is working, advance settings can be made for the next operation thus effecting great savings in time.

The table working surface is 39½"x32". A guaranteed accuracy for all settings of work table and spindle head of .0002".

Consult with us for complete information regarding SIP High Precision Equipment.
Catalogs furnished upon request.

We also represent in the United States other world famous Swiss High Precision Equipment.

ANDRE BECHLER • MAAG GEAR WHEEL COMPANY • MIKRON • SAFAG • STUDER
SALLAZ • SCHAUBLIN • LIENHARD • BILLETER

IMMEDIATE DELIVERY from stock in New York on some machines.

HIGH PRECISION MACHINE TOOLS COSA AND MEASURING INSTRUMENTS

COSA CORPORATION CHRYSLER BUILDING NEW YORK CITY 17, N. Y.

KEEP IN THE LEAD WITH Lees-Bradner HOBBING MACHINES

Rotary and Single Spindle

● Lees-Bradner pioneers of modern high production gear hobbing originated and developed this line of precision machines. The Rotary is built in 4-6 and 8 spindles and is used for the generation of spur and helical gears, sprockets and splines.

Operation is extremely simple as operator merely loads machine, presses a button and all other functions are performed automatically by the machine.

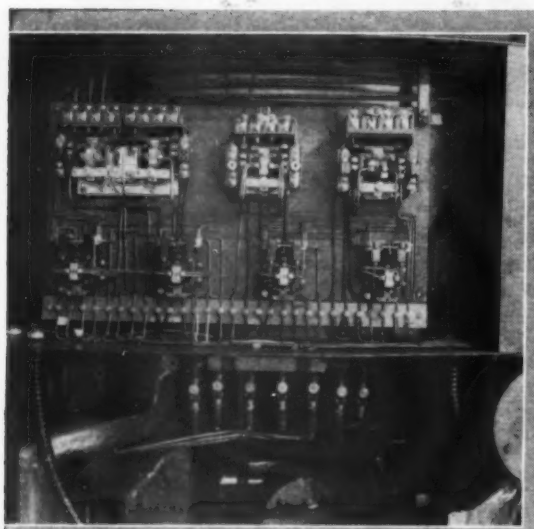
The Rotary is generally speaking a mass production machine and is ideal for the high production of a single job. However it will also handle several different jobs simultaneously, completing a piece in the time of one revolution of the table. Because of this flexibility the Rotary is adaptable to work on which the production might seem too low at first glance.

The Single Spindle Automatic Gear Hobber is also a high production machine of extreme accuracy. It will cut straight serrations, spline shafts, spur gears, helical gears—right or left hand angles up to 45 degrees. It has a capacity for gears up to 7 inches outside diameter and 9 inches face and pitches up to 4 diametral pitch in steel.

The operation of the machine is very simple—does not require skilled help—one operator can handle a battery of machines. The operator merely places work in the machine, presses a button and unloads the finished piece at the end of the cycle.

A battery of Lees-Bradner Production Hobbers at a prominent automotive plant had only 4 rejects out of 750,000 gears inspected. Records like this indicate how well these rugged machines maintain precision requirements and high production.

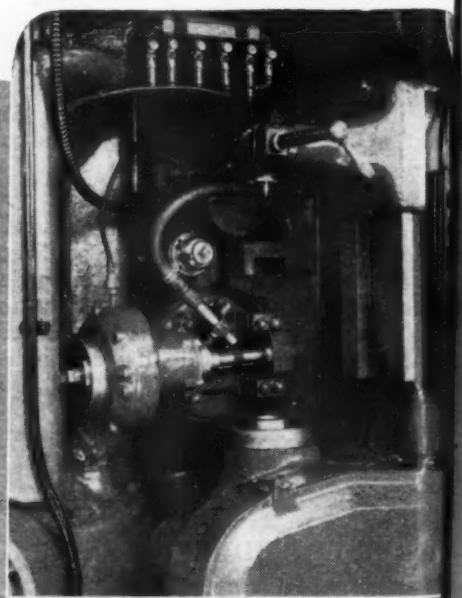
Consult Lees-Bradner on your precision hobbing work.



***Left*—Electric Panel arrangement for Rotary Gear Hobbing Machine.**

●

***Right*—Close up of Hob Head—Work Spindle—and Push Button Control Switch.**

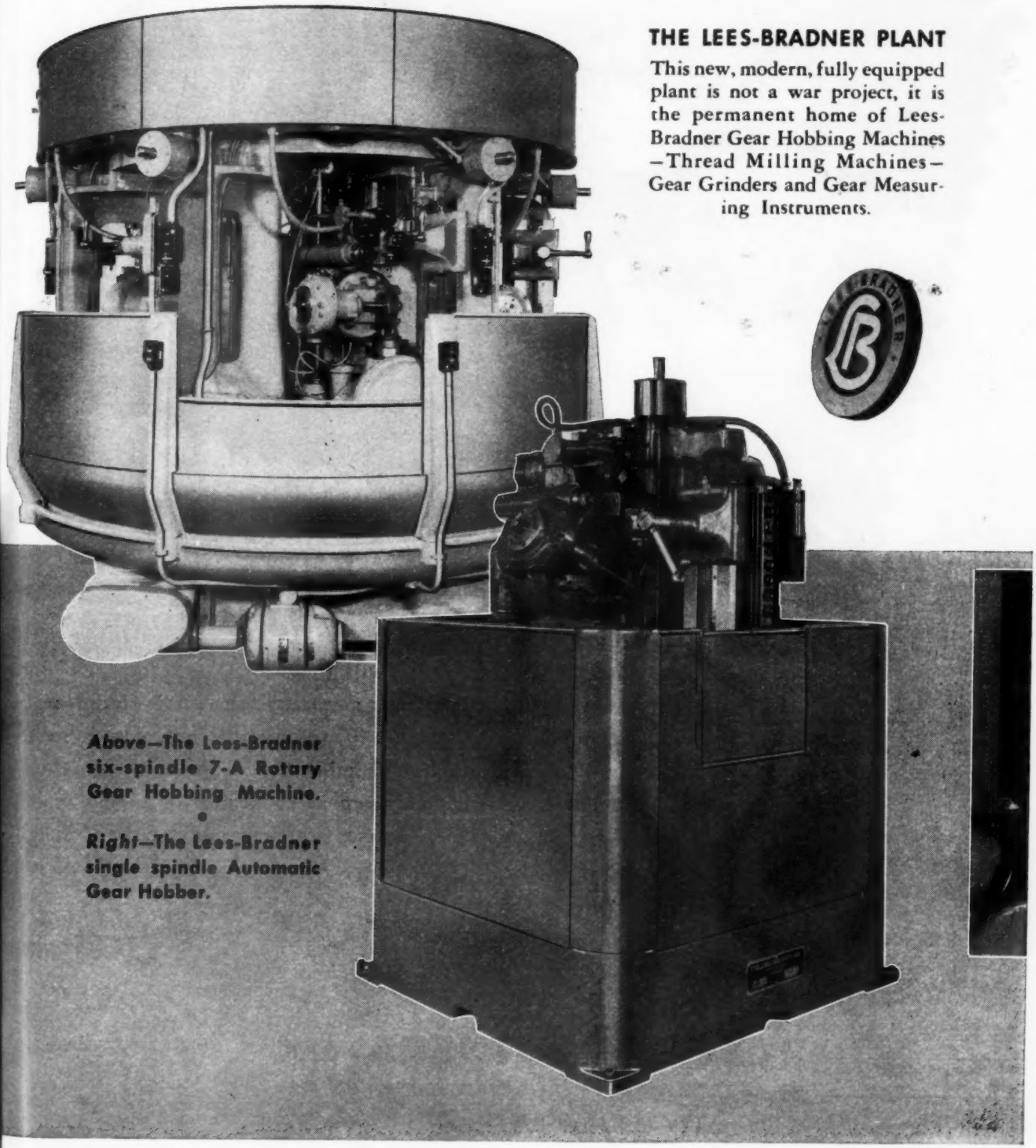


The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

THE LEES-BRADNER PLANT

This new, modern, fully equipped plant is not a war project, it is the permanent home of Lees-Bradner Gear Hobbing Machines—Thread Milling Machines—Gear Grinders and Gear Measuring Instruments.



Above—The Lees-Bradner six-spindle 7-A Rotary Gear Hobbing Machine.

•

***Right*—The Lees-Bradner single spindle Automatic Gear Hobber.**

FOR UNIFORMS OF TOP-FLIGHT QUALITY—*DEMAND*

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"

Follow the lead of the air transport companies — specify *invasion-tested* Reeves Army Twill for durable, smart-looking uniforms. This top-quality fabric helps build customer good will and employee morale. Over 90 million yards have already been sold to the Government to equip America's fighting men, where it is proving itself under the toughest climatic and combat conditions of global war. Sanforized Shrunk* and color-fast to sun, water and perspiration, it will meet *your* post-war uniform needs.

** Residual shrinkage less than 1%*

THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill • Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth • Marine Herringbone • Mountain Cloth • Warrior Twill*

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Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

50 Q. *"We are grinding some aluminum alloy parts and have had quite some trouble due to scratching. This is our first experience with a light metal and we are at a loss to know what to do. Have changed the coolant frequently, and also cleaned the reservoir, but still some of the work is scratched."*

A. You made no mention of a coolant filter, so we assume that you are not employing one, and that may probably be the cause of your trouble. Light metals such as aluminum and aluminum alloys stay in suspension in the coolant much longer than the heavy metals. Therefore, a coolant filter is a "must," and particularly so if the work requires a fairly high finish.

51 Q. *"Will you please list the causes of out-of-round grinding in cylindrical work?"*

A. Out-of-round grinding is usually caused by one of the following conditions or a combination of two or more of them: (1) Dirt on the work centers and in work center holes; (2) poor fit between taper of work centers and work spindle tapers; (3) angles of center in the work not matching angle of work center points; (4) lack of sufficient white lead or oil on work center points, thus causing them to wear; (5) insufficient amount of play between the driving pin and the slot of the driving dog; (6) insufficient number of work rests to properly support the work; (7) lack of sufficient amount of coolant. This retards free cutting action of the wheel which causes heat to be generated unevenly over surface of the work.

52 Q. *"In centerless grinding, does the height of the work in relation to the centerline of the feed wheel and grinding wheel have any bearing on the hardness or softness of the grinding wheel?"*

A. Yes, the work can be higher with soft wheels than with hard because a soft wheel exerts less contact pressure against the supporting blade, and thus there is less tendency to lift or squeeze the work up from the blade.

53 Q. *"What are the advantages of using cut-off wheels in the cutting of metals as compared to cutting them with a saw, shear or by means of a flame?"*

A. The chief advantages in using abrasive cut-off wheels for cutting metals, as compared to other methods, are: (1) The operation permits much greater accuracy; (2) it leaves the ends smooth, thus usually eliminating one operation; (3) it saves annealing if the metal is very hard such as an alloy steel; (4) it is generally much faster than sawing. The principal limitation of cut-off wheels is large size stock and even this is being overcome to some extent.

54 Q. *"We recently obtained a large contract for grinding piston pins. We are well satisfied with the wheels we are using for the roughing operation, but have yet to find a wheel that will give us the required finish. Both operations are throughfeed jobs on a centerless grinder."*

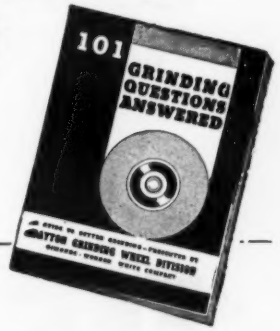
A. For a number of years we have supplied one of the leading automobile manufacturers with a wheel for the finish grinding of their hardened steel piston pins and it has proved highly satisfactory. It is a resinoid bond wheel developed to operate on standard centerless grinding machine speeds. The marking of this wheel is A180-L-15-B (old marking 180 L-1). It might pay you to give this wheel a trial.

55 Q. *"In thread grinding what are the factors which determine the size of grain or grit to be used?"*

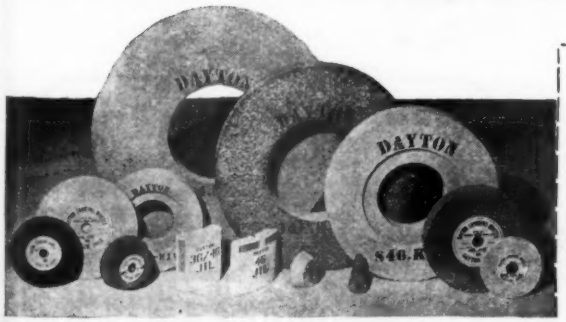
A. The most important factor in selecting the size of grain or grit for a thread grinding job is the pitch of the thread. The steeper or more vertical the pitch, the finer the grain required. However, there are other factors which must also be considered, such as the material to be ground, finish required, wheel speed, etc.

THIRD EDITION READY NOW... a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS



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SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

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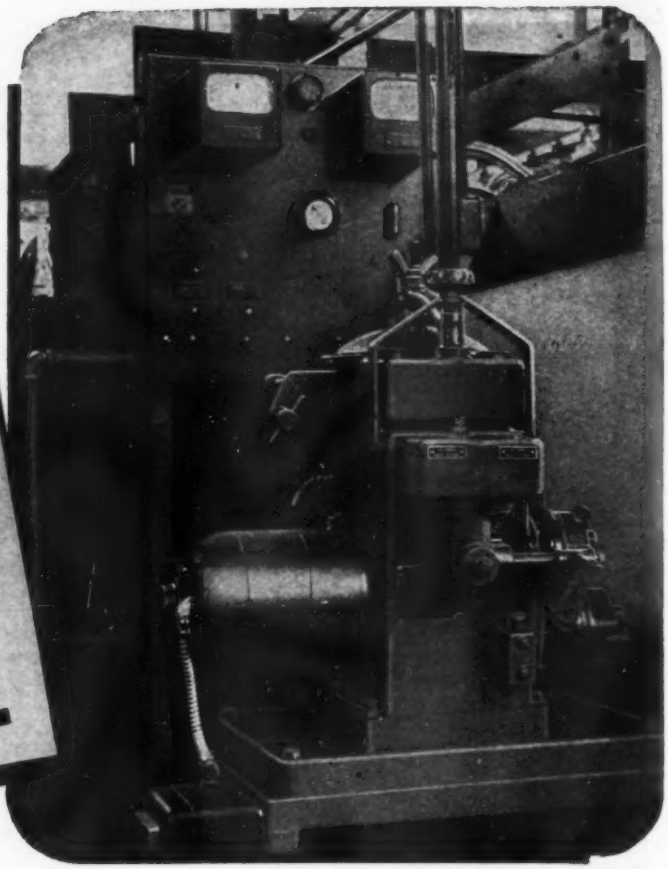
● AT MONROE:
De Laval "Uni-Matic" at Monroe Auto Equipment Co., Monroe, Mich., used to purify shock absorber oil.



WHEN OIL IS *Purified* BY DE LAVAL

...TESTS ARE SAFER...LESS COSTLY

WHEN test oil is kept continuously purified by De Laval centrifugal Oil Purifiers, testing of machinery of all kinds, from shock absorbers to transmissions or automotive or aviation engines, is safer . . . more economical. De Laval Centrifugals continuously remove metallic particles, grit, dirt and water from the oil used in circulating oil systems, eliminating the danger of scoring delicate parts, even though the oil is used over and over again.

De Laval centrifugal Oil Purifiers may be employed in many other ways to reduce production costs in virtually all types of metal working plants. One application, for example, is the removal of foreign material from cutting oil, making higher cutting speeds possible, lengthening tool life and minimizing wear on machine tool parts lubricated by the cutting oil.

Another is keeping grinding coolant free from metallic or abrasive particles by means of De Laval Clarifiers, enabling grinding to closer limits, finer finishes and longer wheel life.

● Write for Bulletin MM-1.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

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PURIFIERS and CLARIFIERS for FACTORY OILS

FOR GREATER OPERATING EFFICIENCY

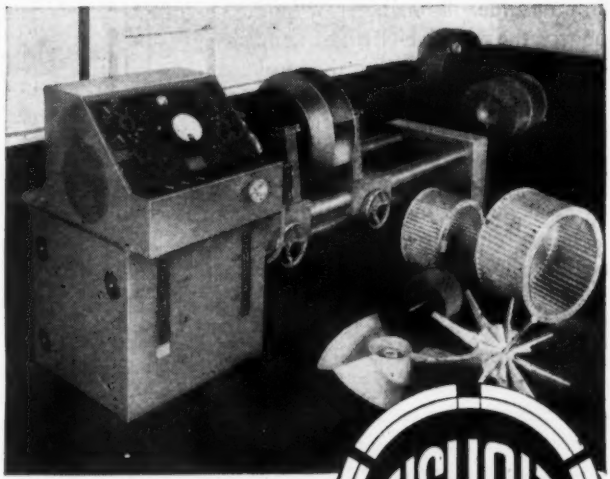
We've been Keeping them *Quiet...*

These weird shapes are fan blades . . . some used for cooling, others for ventilation, still others for circulating heat. But whatever their purpose, *they must be kept quiet!*

GISHOLT DYNETRIC BALANCING MACHINES* take advantage of modern electronics to rid these fans of throb and clatter. Unbalance vibrations as slight as .000025" are *located* with unerring accuracy . . . *measured* through a simple dial reading . . . and quickly readied for correction.

Proper static and dynamic balance gives longer life, higher efficiency to fans . . . to *any* rotating part. There is a Dynetric Balancing Machine to accommodate such parts—from the tiniest rotor for an electric razor, to a giant marine propeller. Whatever your balancing problem, look to Gisholt for the answer. Literature on request.

**A development of Westinghouse Research Laboratories*



GISHOLT DYNETRIC BALANCING MACHINES have the flexibility required to handle a variety of shapes like these. And, despite the small production of such items, the universal nature of the Dynetric Machines makes it possible to obtain accurate balance at extremely low cost.

GISHOLT

GISHOLT MACHINE COMPANY

1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

(Advertisement)

Improving the Machinability of Heat-Treated Parts by Wheelabrating

By J. R. McAllister, Plant Metallurgist
Syracuse Heat Treating Co., Syracuse, N.Y.

At the Syracuse Heat Treating Company, Syracuse, New York, one of the leading Eastern heat treating concerns, three Wheelabrator Tumblasts, a 15" x 20", a 20" x 27" and a 27" x 36", are employed to handle the complete cleaning of heat treated parts. With these machines they are equipped to process metal pieces weighing from a few ounces to over 75 pounds apiece.

Today, more and more companies in the various metal working industries are specifying heat treatments giving specific micro-structures and hardness requirements, but too few are giving the proper thought to surface condition both before machining and before final finishing operations, such as grinding, plating, coloring or polishing. There can be considerable saving of both precious time and money if the proper method of surface preparation is employed for the various finished conditions.

Forging Scale Usually of a Compound Nature

Let us take, for instance, rough forgings that have been properly normalized and annealed for their particular machinability problem. Naturally, as the slug of steel is heated in ovens at the forging plant prior to forming under the hammer, it oxidizes due to the relatively high temperatures needed to condition the steel for hammering. Plus having this scale formed by the oxidation of the metal, it can be noted under the microscope that a large percentage of the surface has been burned away by the oxygen in the surrounding air. The so-called forging scale formed under these conditions is usually of a compound nature having a layer of rather tight scale covered by loose or "feather" scale. The "tight" inner scale is formed in the heating furnaces under the hammer and the loose "feather" is formed on cooling after the piece has been forged into shape. After the forging is cold, it is sent to the heat treater, who then takes his turn at adding and subtracting to the scale condition of the piece. Some of the loose forging scale will drop off while handling from one department to another and more will become free in the heat treating furnace, but chances are that the furnace heat will replace a good share of this loose scale because atmospheres are not generally watched too closely on this rough grade of work.

The Problem of Machining

Now that the forging and heat treating operations are complete and we have a supply of scale which is very hard and brittle, and decarburization which is very soft and weak, our problem is to get a tool to make an even and uniform cut along the surface. This is not a simple problem with the material in this condition. The tool will often times get under way in a normal manner in the soft matrix of decarburization and suddenly hit a hard spot of scale. The easiest thing for the tool to do under these conditions is to break and sometimes cause a many-thousand-dollar shutdown.

There are two major methods of eliminating this condition before machining operations are started. One is pickling and the other is some method of blasting the work with sand, steel grit, or steel shot. The pickling method is being used less and less by commercial heat treaters and forgers because of the danger of pitting the work too deeply so it cannot be cleaned up and also because of the general messiness of the operation.

Removing Scale Down to Virgin Metal

With the use of Wheelabrator Airless speed cleaning machines the removal of heat treat scale is a simple matter because the hard hitting steel abrasive quickly removes the baked-on-scale right down to the virgin metal. Every nook and cranny of the part is completely scoured until every last vestige of scale is removed.

The Wheelabrator method of cleaning is also very effective for removing heat treating scale from machined parts or castings before grinding, plating, coloring and polishing. When cleaning before grinding, the use of a medium sized grit or shot will leave the surface bright and smooth, thus keeping the grinding wheels from loading up with scale and dirt. It is also found that a much larger percentage of work can be ground between wheel trimming operations if a clean scale-free surface is used.

The use of grit blasting for surface preparation of metal to be painted or plated is advisable because the smooth surface is broken up by the force and sharp points of the grit.

American
FOUNDRY EQUIPMENT CO.
317 S. Byrkit St., Mishawaka, Ind.

NEW CENTERLESS THREAD GRINDING

Reduces Costs Up to 80%

The new method of centerless thread grinding reduces production costs of threaded parts an unusually large amount. This is due to the great productiveness of the Centerless Thread Grinder developed by LANDIS TOOL engineers.

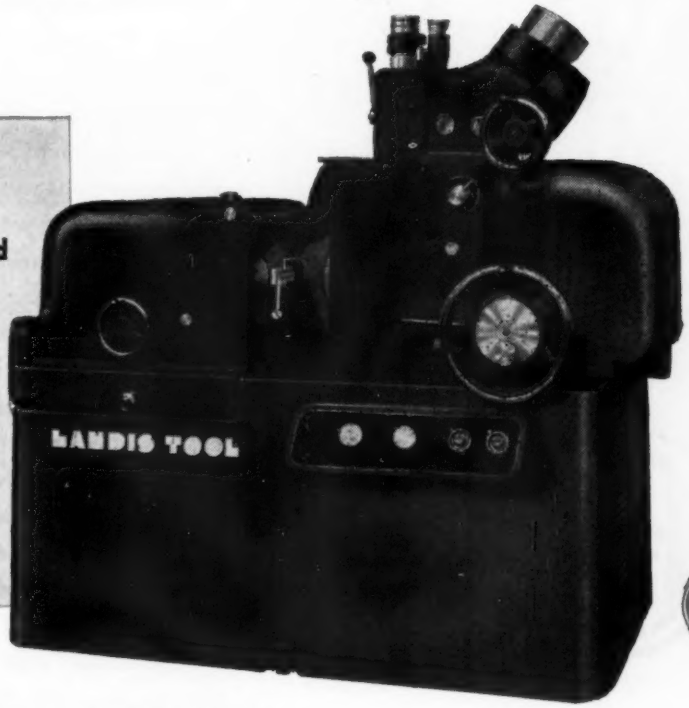
Increases of 500% or more in output per worker help cut costs. An automatic loader steps up output still more. Other factors that help reduce costs as much as 80% are: change from 100% inspection to spot inspection; almost no rejects; short setup time; fast wheel recrushing with built-in crusher. Multiple point grinding with the Centerless Thread Grinder produces strong threads of accurate form. Working from solid hardened stock eliminates final heat treatment and gives a bright, smooth finish of exceptional accuracy.

The new LANDIS TOOL Centerless Thread Grinder can produce a wide variety of thru-feed threaded parts in addition to socket set screws. Our engineering department is available for consultation on your threading problems.

26A

ADVANTAGES

- Continuous thru-feed
- Fewer rejects
- Less inspection
- Less downtime
- Bright finish
- Smooth surface
- No heat treating distortion
- Automatic loader

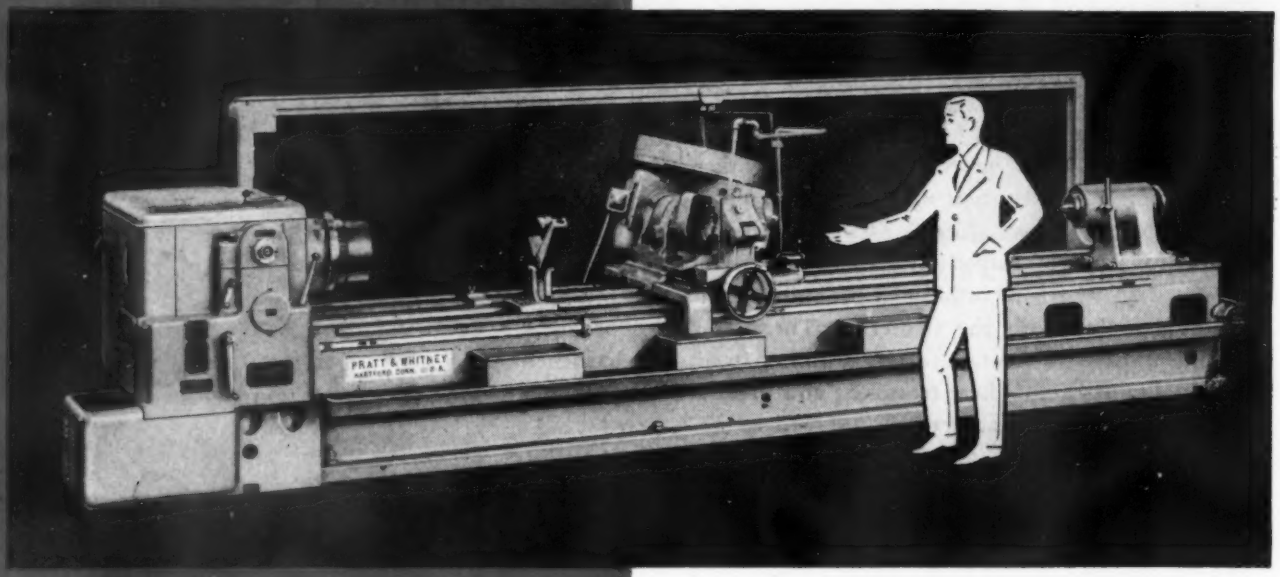


LANDIS TOOL *Precision Grinders*

Socket head screws centerless ground from solid hardened stock. Sizes from 5/8"x 1¼" 11 pitch to No. 4"x 3/8" 40 pitch.

LANDIS TOOL CO., WAYNESBORO, PA.

NEW!



P&W 12″ UNIVERSAL MODEL "C" THREAD MILLER

Here is Pratt & Whitney's brand new 12″ Universal Model "C" Thread Miller — a powerful, rugged machine suited for all types of thread milling up to 12″ work diameter.

This big machine is built to stand up under hard and continuous use . . . has ample power for cuts as deep as 1⅛″. . . yet the resulting threads are mirror smooth and accurate. The machine swings 27″ over the ways.

Forty work spindle speeds and sixteen cutter spindle speeds provide for a wide range. And in spite of its size, conveniently located controls make it easy to operate.

The machine illustrated is the longest available . . . has a center-to-center distance of 168″. The 12″ Model "C" is also available in sizes with center-to-center distances of 30″, 60″, 90″ and 120″. This newest addition to Pratt & Whitney's long line of machine tools will pay for itself many times over wherever it is used. Write us for complete information.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

HARDINGE Second Operation Machines mean better results without expensive tooling

For precision second operation work, the trend is to Hardinge. The initial low cost, the versatility and unusual capacity, without the set-up complications involved with large machines, created an ever-increasing demand for these machines.

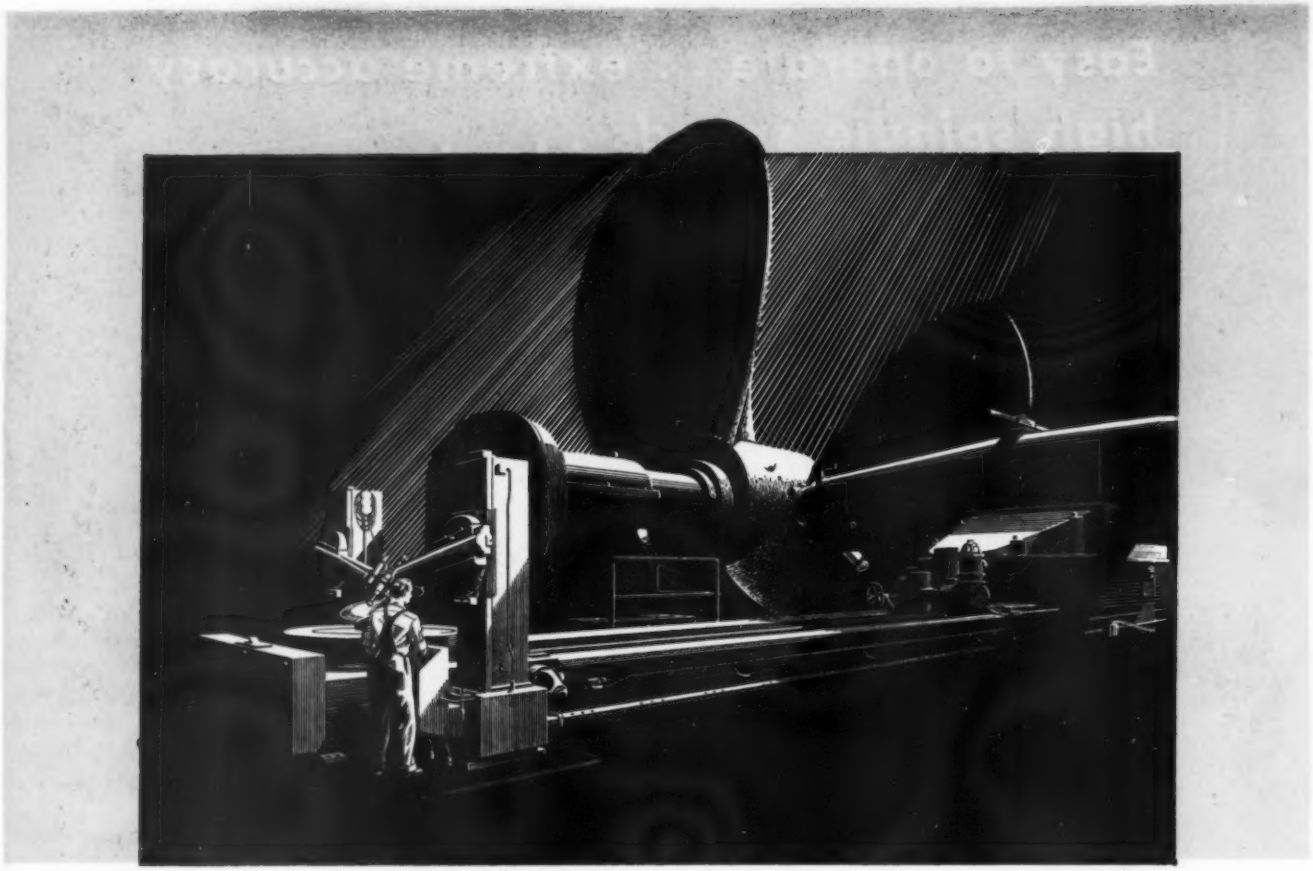
The double tool cross slide and turret take standard tooling. The six-position tilted turret has an automatic indexing and locking head with six independent travel stops.

The illustration shows one of the groups of Hardinge Second Operation Machines in the production of precision aircraft parts at Moore & Steele, Owego, N. Y.

Specifications: 1" collet capacity, 6 " step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 r.p.m.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



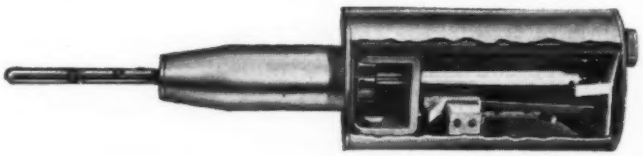
Tracing a pattern FOR FASTER, MORE ACCURATE FINISHING

Now you can machine large or small irregular contours with toolroom accuracy—at production-line speed.

Working from an accurate master—a scale model in wood, plastic or metal—a tracer mechanism guides the cutters of a gigantic adaptation of a universal milling machine. The finished work-piece *exactly* duplicates the complicated, irregular contours of the original. Accuracy remains unchanged regardless of the quantity produced.

At present, the major application of this new electronic method has been in milling ships' propellers. But it's equally adaptable for many different types of work, including castings, forgings and die blocks, which otherwise could be machined only by laborious, inaccurate methods. This equipment can be supplied to control feed speeds in one or two planes, as the application requires.

This new electronic tracer is one of many examples of Westinghouse ability to supply simple electrical solutions to your complicated mechanical problems. When you need this kind of help, call your nearest Westinghouse representative — or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94684



This Westinghouse tracer mechanism translates the shape of a scale-model master into a signal pattern which electronically controls the positions of the milling cutters. They reproduce an accurate, full-size enlargement of the original contour.

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

THE MACHINE IN MACHINE TOOLS

"Put it on the Blanchard"

V-342

These 3" x 1⅝" x ⅜" Cold Rolled Steel Punchings are ground on a No. 16-A Blanchard Automatic Grinder to very close limits and with high production.

In a roughing operation and with one pass under the wheel, .014" of stock is removed. A finish operation grinds to limits of ±.0005". Production is 235 pieces per hour completely finished, which involves the grinding of two sides twice or 940 surfaces per hour.

The No. 16-A Blanchard Automatic Grinder is ideal for quantity production of small parts. It grinds continuously with a wheel that is set and automatically maintained at a fixed height. The operator has only to load the work on the magnetic chuck or fixture. Unloading is automatic, and if desired, attachments can be supplied for demagnetizing and washing the work as it leaves the grinder.

Get These Advantages

- **Production ✓**
- **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- **Flatness**
- **Close Limits ✓**

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

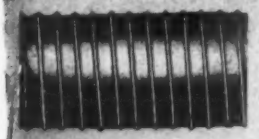
THREAD TOOL AND CUTTER

USED ON ANY SCREW-CUTTING LATHE FOR PRODUCING PERFECT THREADS

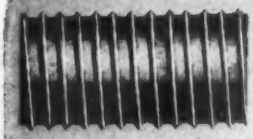
The Rivett Thread Tool mounts on lathe tool slide and takes the place of single point thread tools and chasers. The tool is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth successively to the work. The first nine teeth rough out the thread in nine heavy, measured cuts, the tenth tooth finishes the thread. The ground cutter controls the perfect form and lead of the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. A cutter can be furnished for threads up to 4" diameter in any form and in pitches of six threads per inch and finer.

Write for Bulletin 110

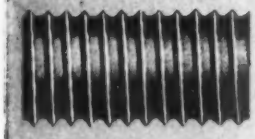
DEVELOPMENT OF THREAD AFTER PROGRESSIVE CUTS



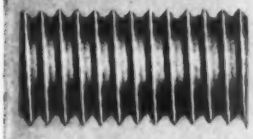
After Cut No. 1



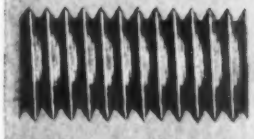
After Cut No. 3



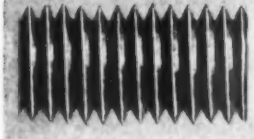
After Cut No. 5



After Cut No. 7



After Cut No. 9

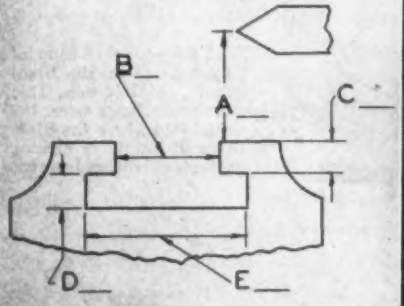


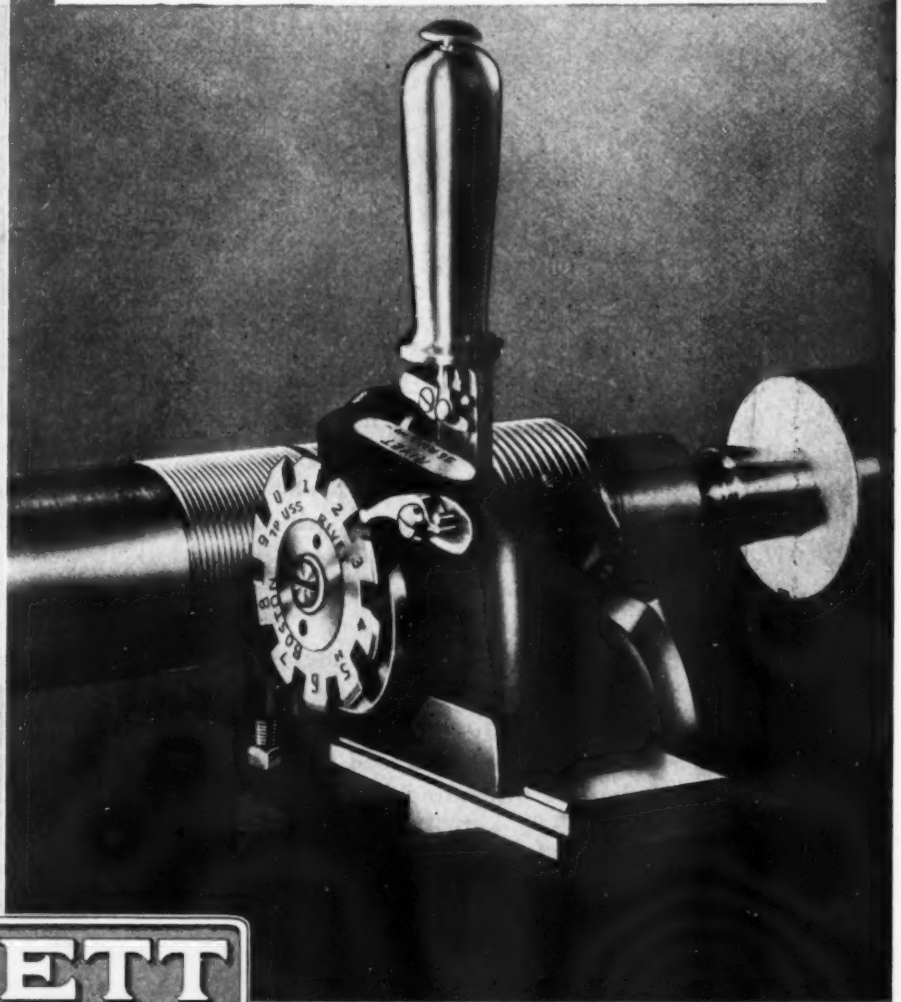
After Cut No. 10

INFORMATION REQUIRED TO FILL ORDER

Base to mount thread tool is machined to fit lathe tool slide and give proper height to cutter. Therefore the five dimensions, marked A-B-C-D-E, on diagram must be given.

A separate cutter is required for each pitch and form of thread. Therefore the form and pitch of each cutter must be given.

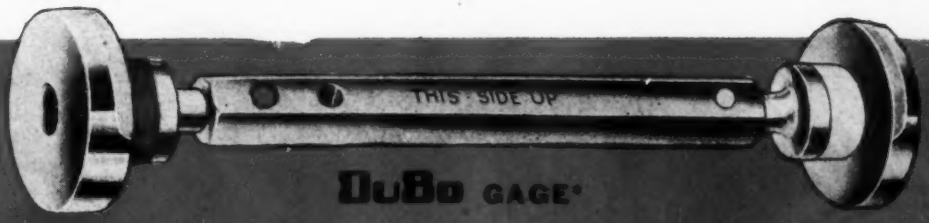




RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.



DuBo GAGE*

4 Notable Contributions to Gaging Progress

by

STANDARD

COMPARATOR DIAL SNAP GAGE*

Decimatic DIAL INDICAT

TeBo GAGE*

GAGEMAKING and gaging processes have advanced enormously in the past few years. And here at Standard Gage Company we've paced those advances . . . often set the pace. In our Engineering Laboratories intensified, continuing research constantly strives to improve inspection, facilitate production, lower costs.

Specific evidence, rather than general claims to leadership, is offered in the gages illustrated. Representing far more than mere style changes, they are the result of persistent study and experiment directed at improving *your* gaging processes.

DuBo—The **better** Plug Gage (fixed limit type). Light in weight, tells more than ordinary cylindrical plug gages.

Comparator Dial Snap Gage—Brings comparator accuracy to the machine. Spherically-surfaced anvils avoid out-of-parallelism.

Decimatic Dial Indicator—Perfect repeatability; instantaneous register; decimal dial graduation; **improved** shockproof construction.

TeBo Gage—Checks both "go" and "not go" in one pass. Adjustable as to tolerance.

*Patent Pending **Patented

Write for Bulletins

ARMY E NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

PRECISE ENGINEERING FOR PRECISION PRODUCTION

now your Big drives

NEW 2000-hp INDUCTION MOTOR LARGEST MEMBER OF TRI-CLAD FAMILY

Dwarfing the original Tri-Clad motor (resting on the conduit box) in size, this new 2000-hp "big brother" embodies all the same protective construction features.

It operates at 1800 rpm, on 2300 volts, 60 cycles. This new 3-phase motor is in the 6360-frame series, which is five steps larger than the largest standard industry frame size (namely 505).

*THE EXTRA

TRI/CLAD
REG. U.S. PAT. OFF.

Special motors can be custom built in Tri-Clad design for *your* problem

Your exceptional drive requirements may call for an induction motor specially designed to the job. Whatever its rating, it can generally be built with many of the Tri-Clad motor's strong points, such as enclosed upper portion, smooth cast-iron end shields, windings of Formex wire, and double-end ventilation.

General Electric's special motor engineering has produced the world's fastest motor, the world's strongest motor, and many other tradition-breaking designs. We'll welcome your unusual problems.

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
TRI/CLAD **Type K**	**1 hp to 2000 hp at 1800 rpm**
TRI/CLAD **Type KG** (High starting torque, low starting current)	**5 hp to 200 hp at 1800 rpm**
TRI/CLAD **Type KR** (High starting torque, high slip)	**Available to 100 hp in speeds required for high-slip flywheel drive (punch press, etc.)**

GE TRI/CLAD MOTORS

Buy all the BONDS you can—*and keep all you buy*

can have it, * *too*

PROTECTION OF CONSTRUCTION

G-E STANDARD Tri-Clad Induction Motors Now Available to 2000 hp

For that important *big* drive (up to 2000 hp, 1800 rpm) you can now get a G-E standard Tri-Clad induction motor. All the protective features that have proved so valuable to service continuity and long life in the more widely used sizes are included:

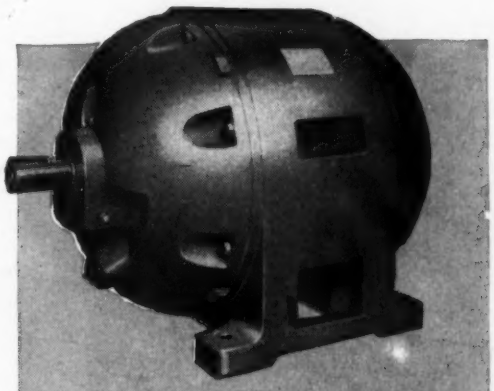
EXTRA PROTECTION FROM PHYSICAL DAMAGE—Cast-iron construction with upper portion completely enclosed to keep out falling objects, dripping liquids. Streamline, cast-iron end shields. Corrosion-resisting finish.

EXTRA PROTECTION FROM ELECTRICAL BREAKDOWN—Windings of Formex* wire are solidly bonded with synthetic resins strongly resistant to heat, oil, and moisture. Formex wire insulation stands up strongly under abrasion or "heat-shock."

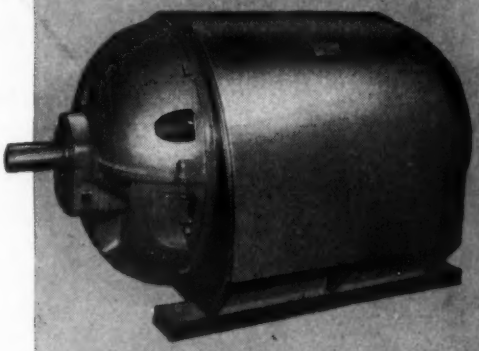
EXTRA PROTECTION FROM OPERATING WEAR AND TEAR—Available with either sleeve or ball bearings—in dust-tight housings. Sleeve-bearing design is a further refinement of well-proved Tri-Clad motor bearing proportions, efficiently lubricated, with "air seal" to insure oil tightness of the housing.

The Tri-Clad, in its wide range of types and sizes, is G.E.'s most widely used (integral-hp) motor. Chances are that there's a Tri-Clad to meet your requirements "on the nose." For information on General Electric's complete line of Tri-Clad motors, ask for GEA-3580. *General Electric Company, Schenectady 5, N. Y.*

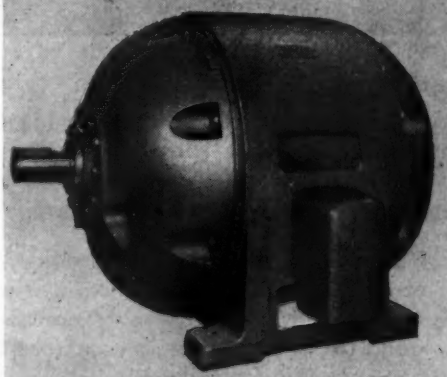
*Trade-mark reg. U.S. Pat. Off.



Typical large-size sleeve-bearing Tri-Clad polyphase motor, now standard up to 2000 horsepower.



Modified cast-iron frame construction used for certain large sizes of the extended Tri-Clad motor line.



Separable housing construction used for large-size ball- or roller-bearing Tri-Clad motors. Roller bearings are standard at coupling end.

GENERAL ELECTRIC

A typical turning operation on a

SIDNEY LATHE

● A typical turning operation is being done on the Sidney Lathe shown—and you can depend upon the finished diameter of the work being well within the tolerance limits required.

The Sidney Lathe is designed to provide accurate, economical and rapid production of work. It is built to provide unusual strength insuring long life and satisfactory performance.

For example the bed departs from the conventional design in that it has four walls with cross girts at 12 inch intervals. This balanced distribution of metal provides greater resistance to deflections and twisting strains. The two outside Vee ways have the greater bearing area to take the downward thrust and accurately guide the carriage. The inside Vee way and flat control the head and tail stock alignment.

This is but one of many advantages offered in Sidney Lathes that result in dependable accuracy over long periods.

Bulletins on all sizes available.

The SIDNEY MACHINE TOOL COMPANY

Builders of Precision Machinery

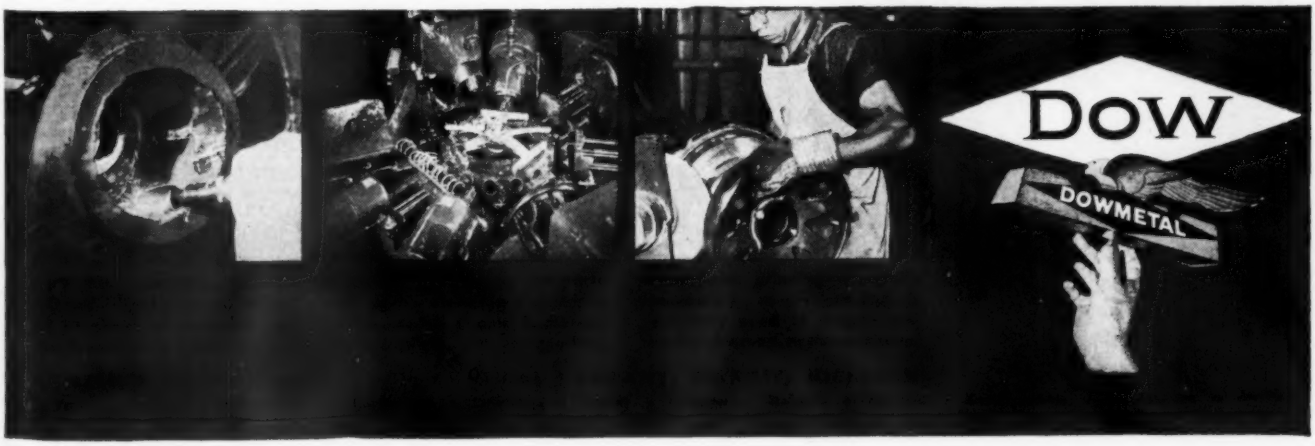
SIDNEY . OHIO

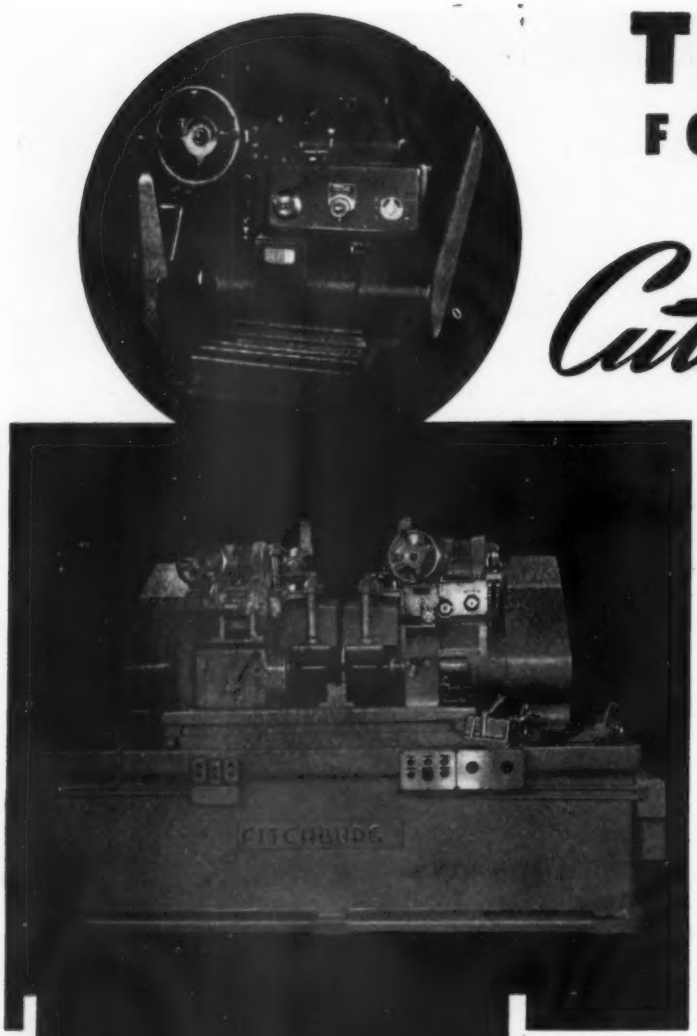
ESTABLISHED 1904

Ready... to make products move!

MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS





THIS HEAD FOR MULTIPLE PRECISION GRINDING *Cuts* PRODUCTION COSTS

Mass production can be applied to precision grinding only with equipment whose design incorporates simple, automatic precision controls. The Fitchburg method works on a new principle, far superior to other methods.

"Brain center" of multiple precision grinding, the Fitchburg Bowgage Head is a completely self-contained and independent grinding unit. It can be installed *singly* on standard equipment in any position and at any angle 0° to 90°, or in multiples to operate simultaneously or consecutively in mass production.

Fitchburg design gives greater accuracy, finer finish, speedier operation, at less cost per piece. See *how* Fitchburg Bowgage heads, standard and interchangeable, save your investment for the reconversion period. Write today for information on how its cut-cost features can be applied to the precision grinding jobs in your plant.

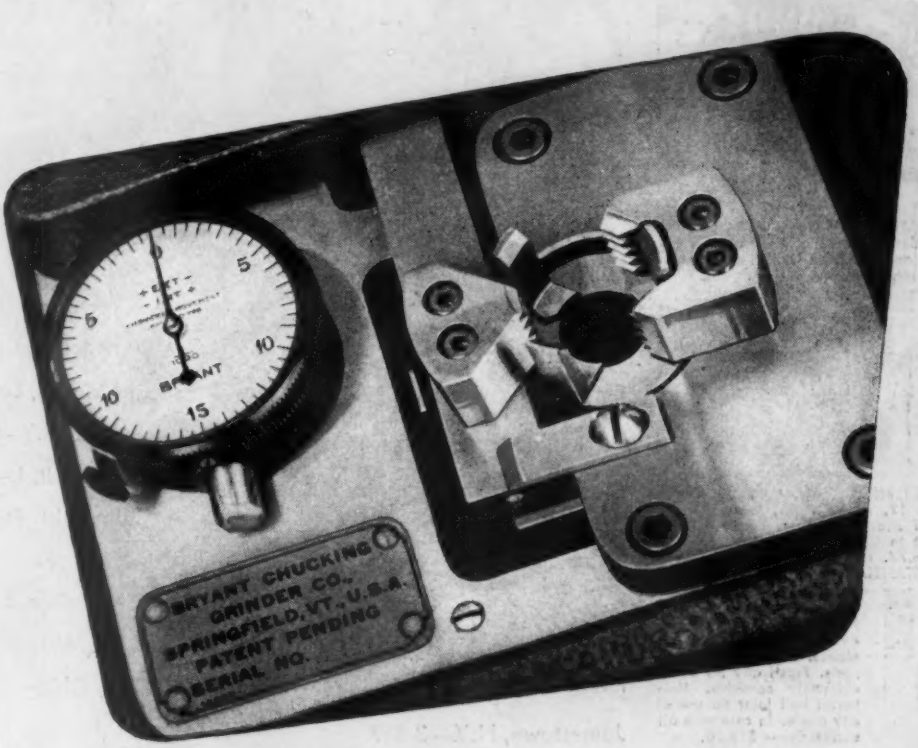
THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Special Fitchburg Double-Head Machine* grinds track roller shafts for caterpillar-type tractors. Two grinding wheels plunge-cut the diameter, after which both wheels travel toward each other to grind the shoulder of the shaft — *all in one set-up — with standard Bowgage Heads.*

Write Today for Catalog—Sent Free Upon Request

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

How to speed thread inspection . . .



Bryant Thread Gages

☆ This new Bryant Thread Gage Catalog describes all the advantages of these unusual gages . . . it tells how you can inspect internally and externally threaded parts four or five times faster . . . it tells how threaded parts can be inspected all over in a matter of seconds . . . it describes and illustrates three standard and one special model for work from 3/8" to 8" internal and 3/16" to 8" external. A free copy is yours for the asking!

send the coupon ➡

BRYANT

CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT CHUCKING GRINDER CO.
Springfield, Vermont, U. S. A.

Please send me Catalog No. G3 which gives complete details on the Bryant Thread Gages

NAME_____ TITLE_____

COMPANY_____

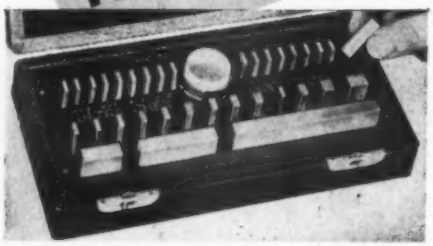
STREET_____

CITY_____ STATE_____

SCHERR TOOLS for reconversion

PHONE YOUR LOCAL SCHERR *agent*

for quick service in your small tool needs.



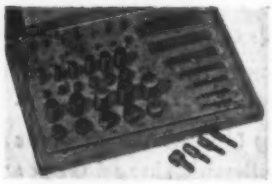
A SET OF SCHERR ULTRA-CHEX GAGE BLOCKS gives you 80,000 combinations in steps of 1/10,000 in. Essential in every shop, and within the budget of any shop at $125.00. Smaller sets available.

SCHERR ADJUSTABLE LIMIT SNAP GAGES in complete sets of 6, 10, 12, or 19 gages, gaging up to 5-11/16". Frames of strong, rigid Meehanite. Gages shipped unset, or set to sizes specified. Sets, $34.83, $66.15, $82.51, $146.77. Telephone our representative regarding NEW SUBSTANTIAL DISCOUNTS.

SCHERR DIAL TEST GAGE famed for long service. Reads to 1/1000" at a glance. Only three moving parts. Practically no wear, extremely sensitive. Universal ball joint for use at any angle. In case with all accessories — $18.00.

REED MICROMETERS measure to 1/10,000" with accurate vernier. Beautifully finished, sturdy, enduring. A super-precision tool for modern close-limit manufacturing. 1", $5.63 2", $6.30 3", $6.98.

SCHERR MAGNE-BLOX transform standard magnetic chucks into special fixtures. V-blocks, parallels, angle irons, can be combined in many ways to hold irregular work magnetically. Set illustrated, $14.50. Others available.



SCHERR PLUG GAGE BLANKS in sets, for speedy finishing to your sizes in your own shop. Avoid delays in starting production. 36 blanks, 7 handles, .029" to 1.010". Complete set, $49.50.

Binghamton, N.Y.— Binghamton 6-5124

Buffalo, N.Y.— Grant 5397

Charleston, W.Va.— 35-644

Cleveland, Ohio — Express 1850

Detroit, Michigan — Townsend 8-9585

Elmira, N.Y.— 7126

Houston, Texas — C-7521

Indianapolis, Ind.— Humboldt — 2518

Jamestown, N.Y.— 3-819

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Pawtucket, R. I.— Blackstone — 1234

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Pittsburgh, Pa.— Hemlock — 5800

San Francisco, Calif.— Underhill 2991

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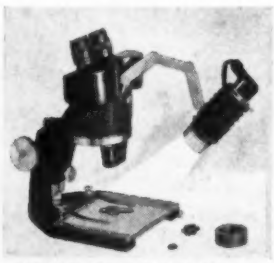
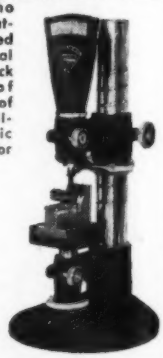
Write for our 46-page catalog

SCHERR MAGNI-RAY both magnifies and floodlights work under inspection. Lens of genuine optical glass, ground by experts to avoid distortion. Allows three-dimensional vision. Heavy base and adjustable supporting column. 3" lens, $18.50. 2" lens, 3x, $27.50. 5" lens, for large work, $33.00.



SPENCER BINOCULAR MICROSCOPE gives you real "two-eye seeing" with high magnification for most critical inspection of small parts, contours, surfaces. Reveals scratches, markings, metallurgical structure, minute imperfections. Choice of four objectives — .7x to 6x — and four pairs of eyepieces — 9x to 18x — Price, with case, $123.50.

SCHERR COMPARITOL the inspection tool that multiplies measurements, making .001" occupy 3/4" on the scale. No need for educated feel — Comparitol gives the same reading no matter who uses it. Many attachments, fitted V-blocks, special forms for quick inspection of wide variety of parts. Also available with metric scale. Write for full details.



GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12 N. Y.

BARBER-COLMAN *ENGINEERED* MILLING CUTTERS

CUTTERS USED IN GANG

1 Half Side Mill 7-3/8" x 1" L.H.

1 Interlocking Spiral Plain Mill 5-1/2" x 2-23/64".

2 Interlocking Profile Type 'Form Cutters 5-1/2" x 2-15/16" (held ±.0005" on form.)

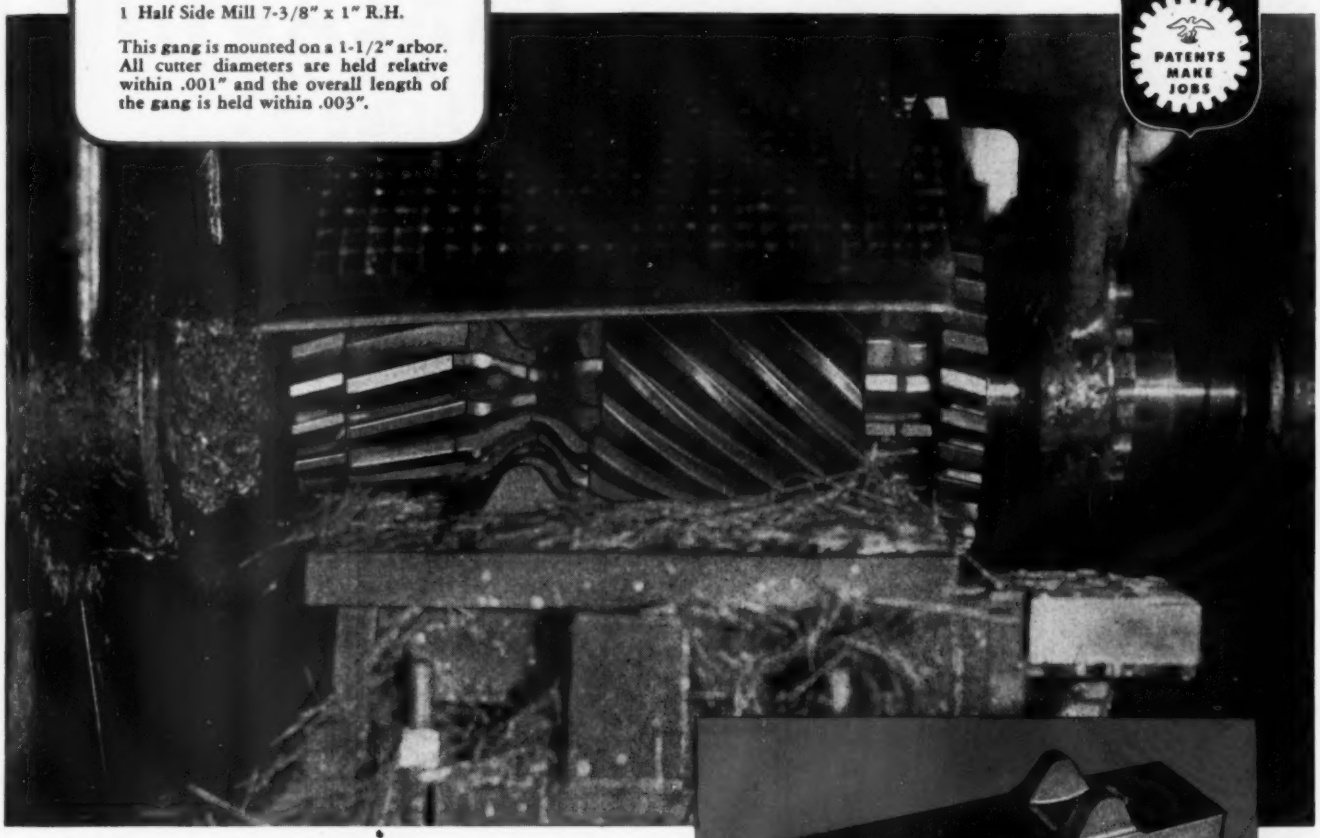
1 Heavy Duty Plain Mill 5-1/2"x5-5/8".

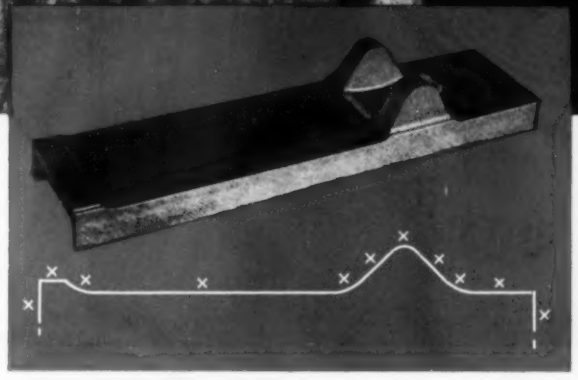
1 Interlocking Profile Type Form Cutter 5-1/2" x 1-3/8".

1 Half Side Mill 7-3/8" x 1" R.H.

This gang is mounted on a 1-1/2" arbor. All cutter diameters are held relative within .001" and the overall length of the gang is held within .003".

PATENTS MAKE JOBS





THE principal advantage of using a gang of cutters on a job like this is found in the great reduction of set-up and operating time. The cutters that make up the gang may very often be only slightly modified standard types. On the job shown here, seven cutters are combined to mill 5 flat surfaces, a radius, and a humped form, all in one pass of the work through the machine. The complete job is done in two cuts, roughing and finishing, the two half side mills being added on the finishing operation for sizing length. A feed of 3-1/2" per minute and a cutter speed of 57 r.p.m. are used for the roughing cut, to produce 31.8 pieces per hour, removing 1/16" stock. For finishing, the feed is increased to 3.67" per minute, stock removal is .012", and production is 33 pieces per hour. These cutters produce 1000 pieces per grind and 40 grinds per cutter, a total production of 40,000 pieces per gang. Material is Arma Steel Casting, Grade "B", with a Brinell of 163-207.

For economical profile milling, use Barber-Colman ENGINEERED Milling Cutters in gangs.

SPECIAL GANG CUTTERS MILL PROFILE ON 33 TOUGH CAST STEEL PLATES PER HOUR

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

TAPPING OR THREADING

Acme XL Threading Machines Can Do Either!

THESE BRONZE NUTS are tapped on an Acme XL 3" single spindle Threading machine at the Duff-Norton Manufacturing Company, Pittsburgh, Pa., manufacturers of lifting jacks. The tap is held by an adaptor which can be quickly and easily slipped over the regular Acme Tangent Die Head. The jack screws used in conjunction with these nuts are, of course, threaded on the same Acme XL Threading machine. For more information concerning the versatility of Acme XL Threading machines, write for bulletin XL-9!

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 4535 St. Clair Ave. Cleveland 14, Ohio
ESTABLISHED 1882

FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" HYDRAULIC SURFACE GRINDERS "CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

INGERSOLL *Inserted Blade* CUTTERS

METAL REMOVAL AT LOWEST COST

- You purchase *one* cutter housing for each application.
- You fill and refill this housing many times with *inserted blades* at fraction of cost of new solid type cutter.

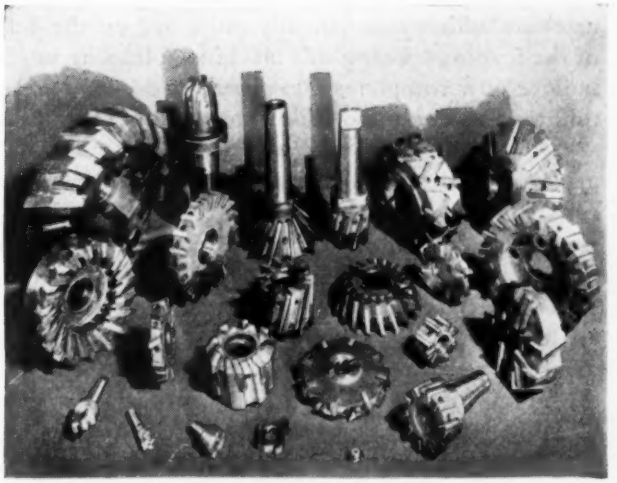
BUY BLADES FROM

INGERSOLL

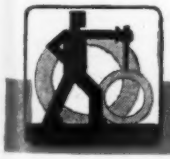
High Speed Steel — Cast Alloy — Carbide Tipped

Ingersoll offers many designs of *inserted blade* milling and boring tools — Face mills, end mills, slotting cutters, helical slabbing mills, cylinder boring, combination boring, chamfering and facing. Ingersoll blades are lowest in replacement cost and over 50% useable.

When a solid type cutter has worn down it is necessary to invest in another complete cutter. With *inserted blade* design the housing is a capital investment and only the blades are a continuing operating expense.



Write for catalog giving complete details of Ingersoll *inserted blade* milling and boring tools.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

ELECTRONIC CONTROL OF FEED RATE

Thy-mo-trol drive operates the work feed on this Sundstrand-built "copy mill", which cut fin-milling time 35 per cent.

HELPS CUT FIN-MILLING TIME 35%

● **For one of the war's most vital machining jobs**—aluminum cylinder heads for aircraft—the Sundstrand Machine Tool Company has developed a special machine which automatically mills fins on the walls of the forgings. Using this machine, a leading engine builder now completes these heads in 35 per cent less time than was required with a conventional feed drive.

Key to the increased production is optimum-speed machining, despite continual changes in depth of cut. G-E Thy-mo-trol drive gives precise control of feed motor speeds over a range from 175 to 1750 rpm. By means of its sensitive electronic control, it varies the feed rate automatically in inverse proportion to the load on the spindle motor. Light cuts go fast, deep cuts go slowly, and the fragile cutter required for this fin milling operation is kept loaded to the maximum safe working capacity.

Operated from an a-c power source, G-E Thy-mo-trol drive supplies closely controlled d-c power for stepless control of speed and torque over an unusually wide range. Thy-mo-trol drives are being "built-in" to all kinds of machines where power demands are between ⅛ and 25 hp. Grinders, milling machines, turret lathes, and thread mills are among the machine tools whose production has been stepped up by their use.

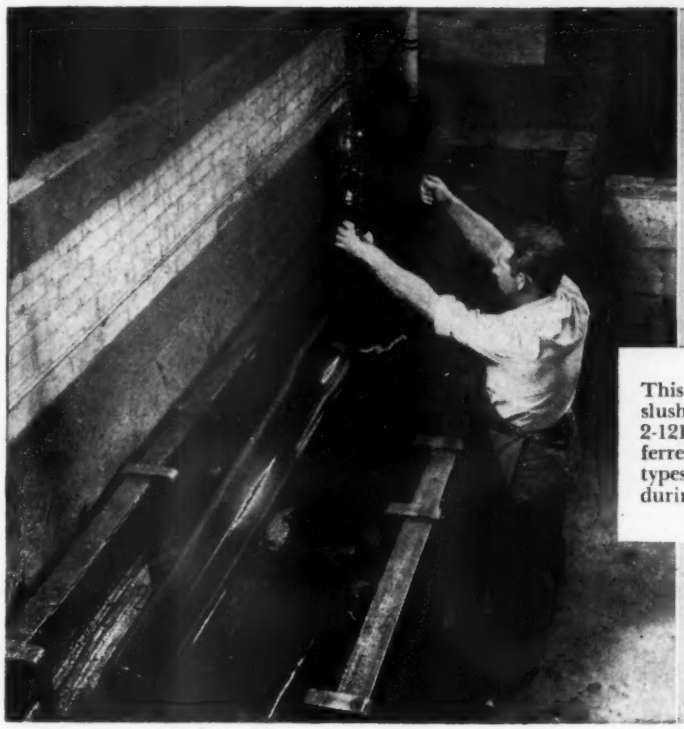
A co-ordinated set of equipment, Thy-mo-trol drive includes d-c motor, electronic panel, transformer, and control station. G-E engineers will help you select and apply Thy-mo-trol to your machines, or explore their suitability for new functions. Ask for Bulletin GEA-4025. *General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

676-178-8950

THY-MO-TROL DRIVE

Buy all the BONDS you can—*and keep all you buy*



This tube for a 105-mm. howitzer is being slushed with Gulf Rust Preventive Compound 2-121. Gulf quality rust preventives are preferred by many war plants for protecting all types of metal parts and military equipment during storage and transportation overseas.

Protect your surplus tools and equipment with GULF QUALITY RUST PREVENTIVES ...a complete line to meet your every need!

RECONVERSION time is rust-prevention time! Act now to be ready for prompt rust-proofing of yours as well as Government-owned tools and production equipment.

From Gulf's complete line, you can select one or more war-proven rust preventives that will meet your every requirement for both interior and exterior use—and provide positive protection for indefinite periods.

Gulf quality rust preventives have given an excellent account of themselves in protecting all types of metal parts and war equipment during storage and transportation overseas. They meet Government specifications for exterior and interior application, and are available now for immediate delivery.

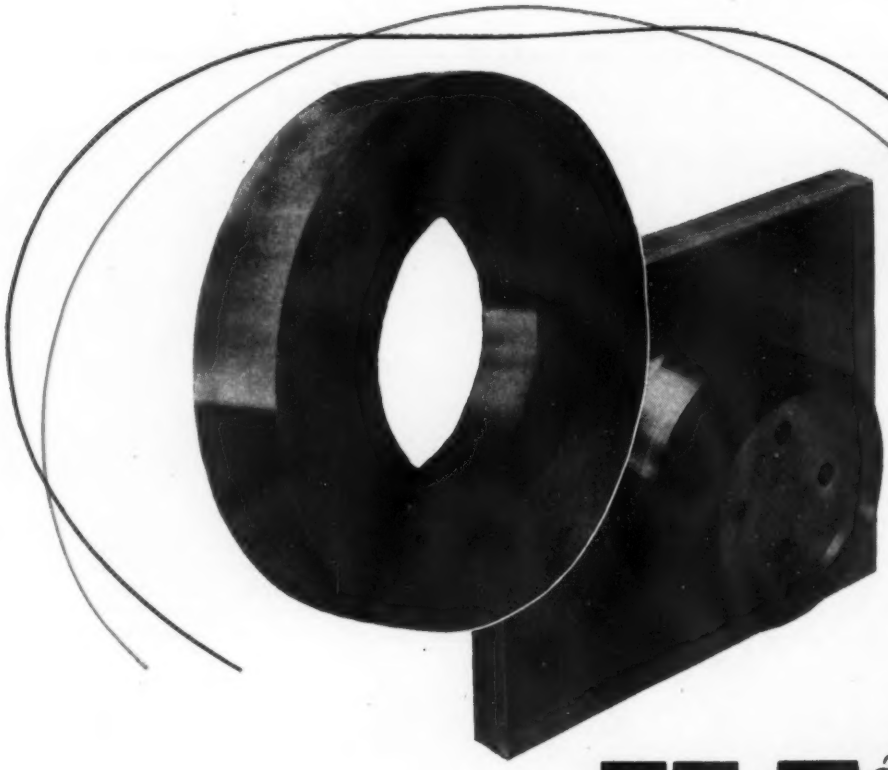
For further information on Gulf quality rust preventives, write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF INDUSTRIAL LUBRICATION



over a HALF

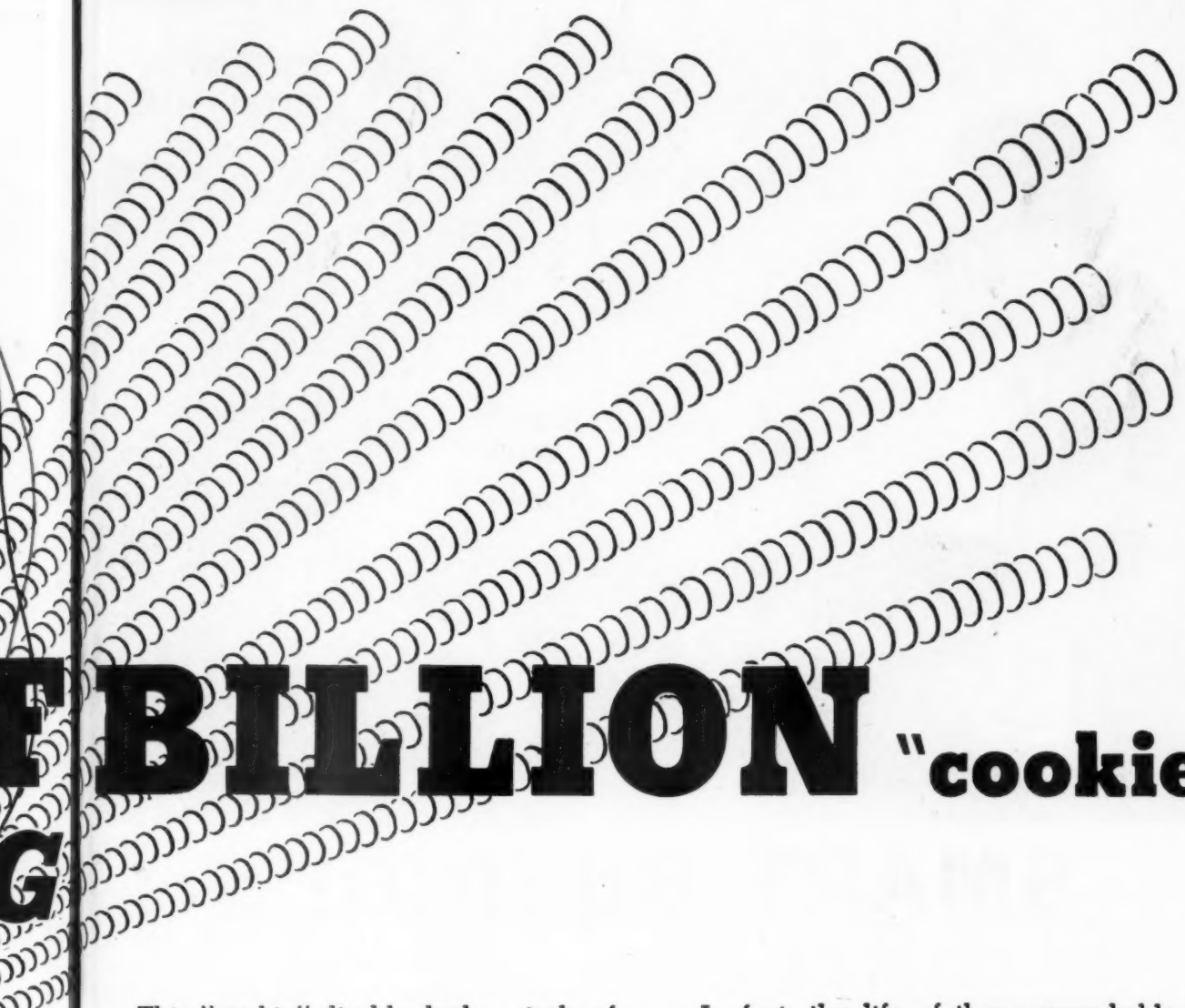
. . . and *STILL GOING*

with these Diecarb dies

SEVERAL years ago, in a Pittsburgh electrical manufacturing plant, a disc or "cookie" die was placed in operation. It was made of Diecarb, Firth-Sterling's newest, original, sintered carbide development for blanking dies.

GET IN TOUCH WITH US

A complete Diecarb engineering service is at your call—for designing complete dies; for aiding in application of Diecarb to die shoes by brazing; shrink-fitting; press fitting and mechanical matrix; and for proper grinding.



BILLION "cookies"

This "cookie" die blanked a circle of silicon electrical sheet .025 inch thick, to be used in rotors and stators.

It proved so successful that since then two other similar Diecarb dies have been put to work—all averaging *50 to 60 million* blanks per grind, as compared with 90,000 pieces per grind with high speed steel dies.

The original die, at the latest count, had produced the unprecedented total of over a half billion stampings, and was still going!

In fact, the life of these remarkable Diecarb dies is not yet determined because all dies so far made are still in use.

Diecarb can be used for blanking and forming a diversity of materials including metals, plastics, paper, etc. It operates successfully on thicknesses up to 7/16 inch. It is proving unmatchable for high production operations, saving both downtime and maintenance.

If you have a product that requires blanking or if you are planning one—call in Firth-Sterling now to test the possibilities of Diecarb.

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. · NEW YORK · HARTFORD · PHILADELPHIA
PITTSBURGH · CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES

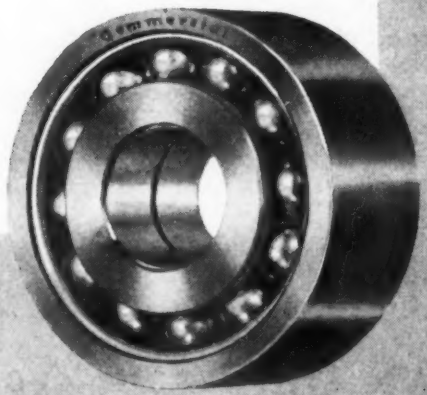
SMART BUYING!

Smart buyers specify Schatz "Commercial" ball bearings, — the short-cut to manufacturing economy. "Commercial" ball bearings are sturdy, efficient and moderately priced.

Schatz "Commercials" are available in all types and sizes and, if you have a difficult installation, Schatz will make special bearings exactly suited to your needs.

SCHATZ
"Commercial"
BALL BEARINGS

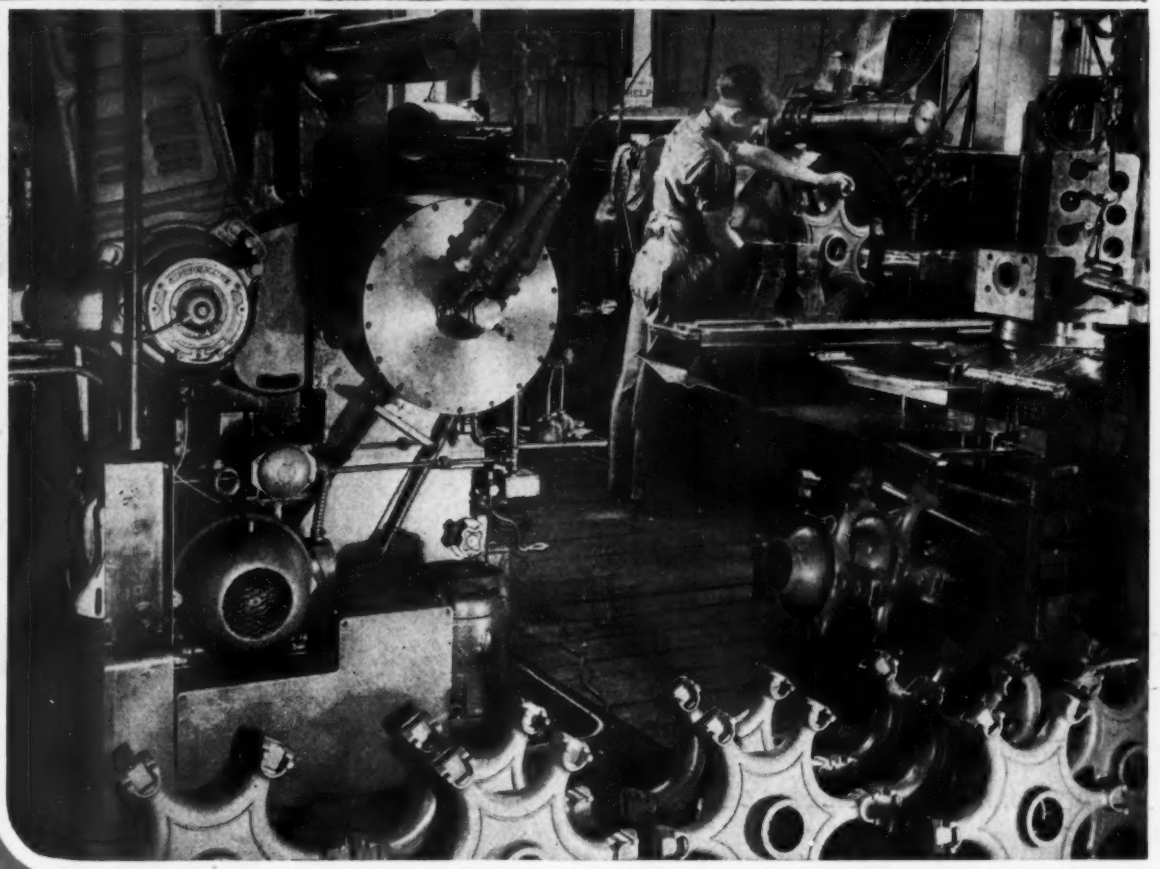
FOR DEPENDABLE BALL BEARING SERVICE USE SCHATZ "COMMERCIALS" IN YOUR PLANT OR PRODUCT.



THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
Chicago: 902 S. Wabash Ave.—5 • Los Angeles: 5410 Wilshire Blvd.—36

CLARK EQUIPMENT COMPANY *makes minutes count with* P&J 6 DREL AUTOMATICS

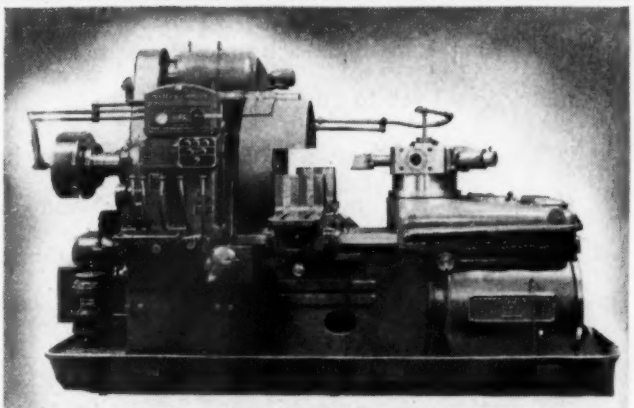


A combination of versatile tooling, power, rigidity and convenience in handling, inherent in P&J Automatics, has enabled the Clark Equipment Company, Buchanan, Michigan, to speed up the production of truck wheel spiders. An idea of the job being handled can be obtained from photograph taken of the operation.

If specific figures were permitted, they would show how the performance is outstanding in terms of time and quality of work and why the production executives of this plant are so very well satisfied with their P&J machines.

Potter & Johnston 6-DREL Automatics incorporate in their design features which assure great flexibility and high productive capacity. They make minutes count in duplicate parts production and thereby cut costs.

It will be to your advantage to consult P&J engineers on your chucking operations and get time estimates on handling them on P&J Automatics.



P&J DREL AUTOMATICS ARE DESCRIBED IN DETAIL IN BULLETIN 118, AVAILABLE PROMPTLY ON REQUEST.

POTTER & JOHNSTON MACHINE CO.
Pawtucket . . . R. I.

MORE BONDS WILL FINISH THE JOB QUICKER . . . BUY THEM NOW.

Install in 1945 do not lubricate

Prelubricated ball bearings, now standard on Westinghouse CSP Motors up to 3 hp, require lubrication only after five years' or more service

Westinghouse Type CSP Motors, 3 hp and below, bought in 1945, will not require lubrication before 1950. Think of it! Five years of operation : : : 24 hours a day : : : with no attention whatever to lubrication. In 1950, inspect bearings. If greasing is needed—a simple disassembly job—and the motor is all set to run until 1955.

These prelubricated sealed ball bearings have been thoroughly field-tested in textile mills and in built-in machine tool installations. Early installations are still running on the original grease after seven years' service.

CSP motors may be mounted in any position, including the vertical. Wherever Class A insulation is applied, at least five years of operation without greasing may be expected. Applications in higher than normal ambient temperatures may require modified design.

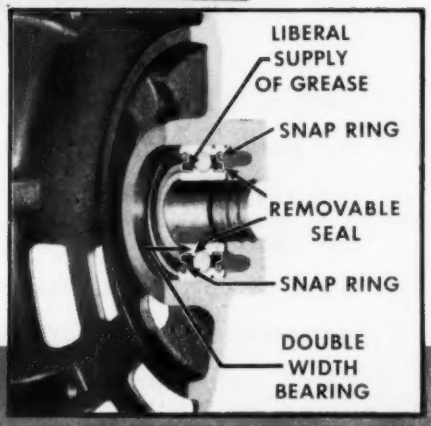
For complete information, ask for DB-3100-CSP at your Westinghouse office. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21326

ONLY WESTINGHOUSE CSP MOTORS OFFER ALL THESE ADVANTAGES
• PRELUBRICATED SEALED BALL BEARINGS reduce lubrication maintenance . . . assure longer grease life.
• IMPROVED TUFFERNELL INSULATION.
• DYNAMICALLY-BALANCED ROTOR.
• DIE-CAST ROTOR with oversize fan.
• LIBERAL THROUGH-VENTILATION—air enters front, leaves at drive-end of motor.

before 1950!

This label appears on the end bracket of every CSP motor up to frame 225. It is your assurance of smooth operation, long bearing life, and low maintenance. It also means:

- No overgreasing.
- No grease seepage into windings.
- No unreplaced plugs.
- No costly lubricating schedules.
- No grease contamination.
- No "skipped" bearings while greasing.



HOW IT WORKS

High-grade, long-life grease, specifically designed for these bearings, is packed into the bearing assembly by the bearing manufacturer. This original grease is good for at least five years of normal service. Double-width, single-row construction permits a more liberal grease supply and better sealing than the single-width design. Two seal discs, locked into the outer race by snap rings, fit closely over the inner race to form a revolving seal.

When motor is disassembled for other reasons, this construction keeps dirt out of bearings just as effectively as the cartridge bearings now in common use.

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

TYPE CSP MOTORS

FEDERAL SPEEDS POST-WAR PRODUCTION

Here is a small, compact, light-weight ball bearing that is setting the pace in many different industries. Hundreds of thousands of Federal Type 1206 are being installed in automotive generators, electric motors, small electric lighting plants and similar products. Used in vast quantities previous to the war by American manufacturers, Federal Type 1206 later served our armed forces on every battlefront, — a little giant among ball bearings now available for peacetime service.

FEDERAL
BALL BEARINGS

THE JEWELS OF INDUSTRY

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
Chicago: 902 S. Wabash Ave.—5 • Los Angeles: 5410 Wilshire Blvd.—36

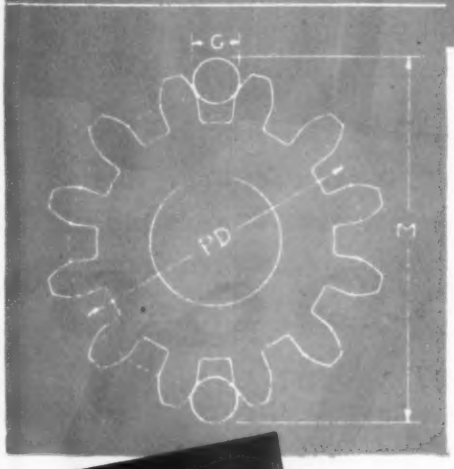
Van Keuren

simplified GEAR MEASURING SYSTEM

Set No. 26 Ex. Gear Measuring Wires

...provides

GREATER ACCURACY... *and* SIMPLIFIED CALCULATIONS



Simple! . . . The only calculation required is one of simple division.

Reliable! . . . The system is based on formulas approved by the American Gear Manufacturers Association.

Accurate! . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size.

Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 5 to 171 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. The tables provide for measuring external, internal and helical gears. They are far more accurate than anything previously available and no interpolations are required.

ULTIMATE ACCURACY

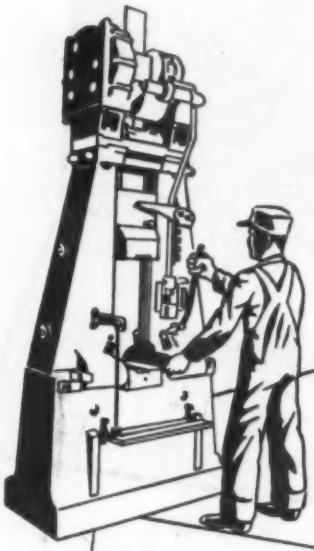
Our Catalog No. 33 is a manual of precision measuring systems, giving complete tables and simplified formulas for measuring all standard threads, splines, gears, and worms. Send for this valuable handbook.

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

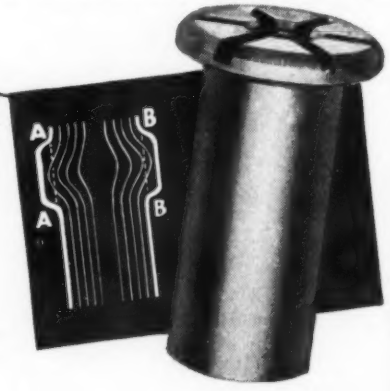
25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles.

YOU GET CORROSION RESISTANCE PLUS



LOWER UNIT COSTS. This aircraft fuel supply valve body was forged from Carpenter *Stainless No. 8* (*Type 303*) forging bars. Our *machine-turned* billets, from which all Carpenter forging bars are rolled, provided freedom from injurious surface defects, reducing rejects to a minimum. The corrosion resistant properties of Stainless No. 8 licked the danger of "valve sticking" from high octane gas.



LONGER LIFE. In spite of tremendous pressures and highly abrasive conditions in service—forged knuckle pins like this stay on the job longer because they are made from Carpenter Stainless. And note in the diagram that forging produced an even grain flow throughout, thus strengthening the thin sections at points AA and BB.

POSITIVE PROTECTION against corrosion to withstand the effects of repeated sterilization plus the required strength and hardness, made Stainless a natural choice for these forged surgical instruments. Clean, flawless Carpenter Stainless forging bars reduced rejects, increased output.

ECONOMICAL, TROUBLE-FREE FORGINGS WITH *Carpenter* STAINLESS

If rejects run high when forging Stainless, it's time to check all along the line. Many factors must be controlled right in the forge shop. But to eliminate trouble and secure best results you must be sure that your forging bars are sound, clean and free from injurious surface defects. Such forging bars assure easiest forging operations and lowest production costs.

At Carpenter, Stainless Steels are made in a tool steel mill to tool steel quality standards. Stainless billets are disc-inspected to assure soundness and homogeneity—and are then *machine-turned* to remove all surface imperfections. By this painstaking process we end up with Stainless bars that, lot after lot, assure economical, trouble-free forgings.

You'll find your nearby Carpenter representative extremely helpful when it comes to finding ways and means of applying Stainless to your postwar products. Back of him stands a company with years of practical experience in solving Stainless problems. Call him in today or write us at the mill.

PUT THIS BOOK TO WORK! In addition to specific Stainless forging information, our 98-page book "Working Data for Carpenter Stainless Steels" shows you how to select and fabricate a wide variety of Stainless Steels. Be sure to get your copy! A note on your company letterhead, indicating your title is all that's necessary. Write today!

THE CARPENTER STEEL COMPANY • 109 W. Bern St., Reading, Pa.

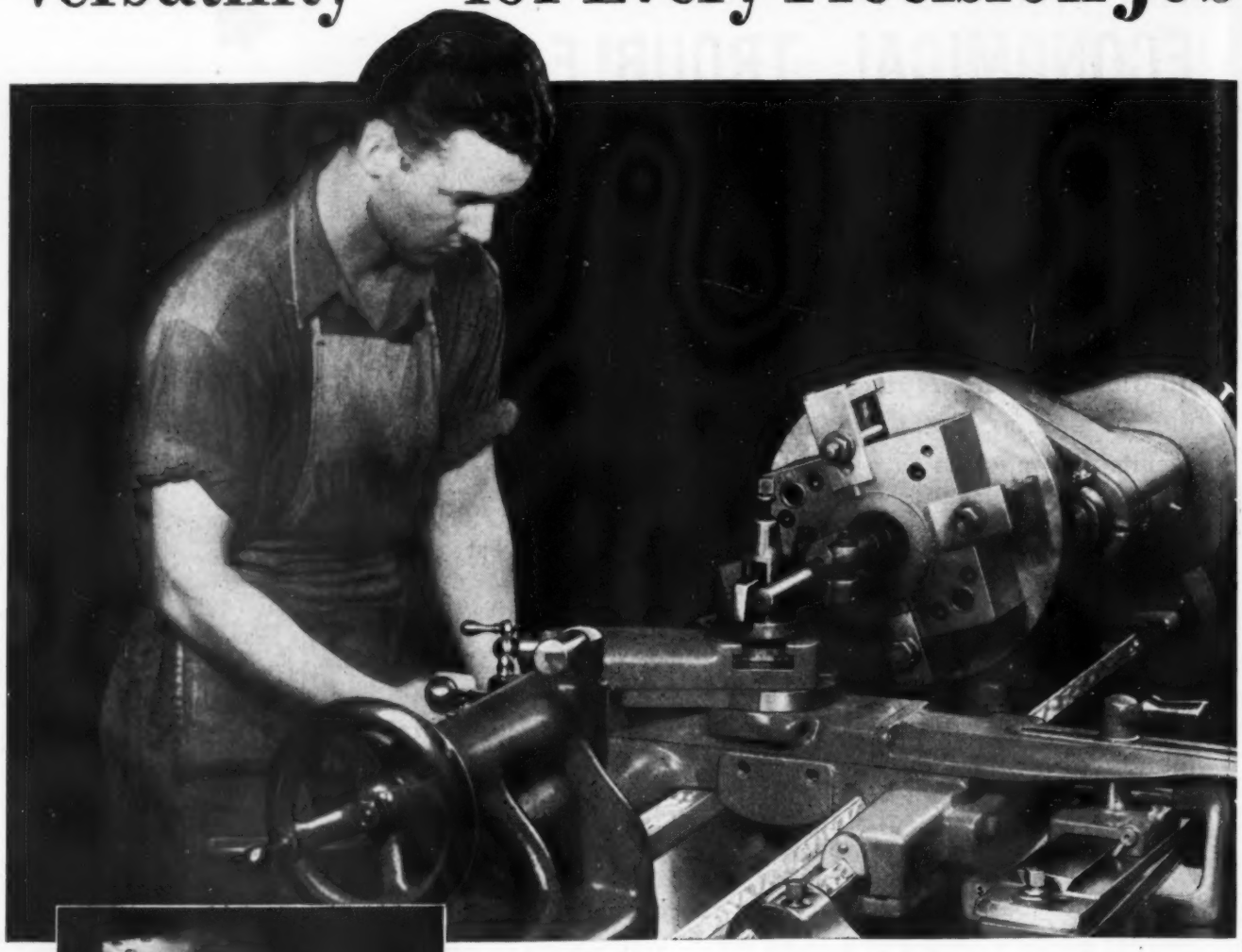
GIVE YOUR PRODUCTS THESE EXTRA ADVANTAGES . . . With Carpenter Stainless

- **Strength and Rigidity**
- **Heat Resistance**
- **Weight Saving**
- **Freedom from Rust**
- **No Plating to Peel**
- **Ease of Assembly**
- **Longer Product Life**
- **Sales Appeal**

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, Providence, St. Louis

Versatility---for Every Precision Job



SOUTH BEND ATTACHMENTS BROADEN THE SCOPE OF YOUR LATHE WORK

A complete line of attachments and accessories simplifies tooling South Bend Lathes for many special and unusual kinds of precision work. They save time and effort, often eliminate the delay and expense of special fixtures, and greatly broaden the scope of your lathe work. Write for Catalog 77-R in which all of these attachments are illustrated and described.

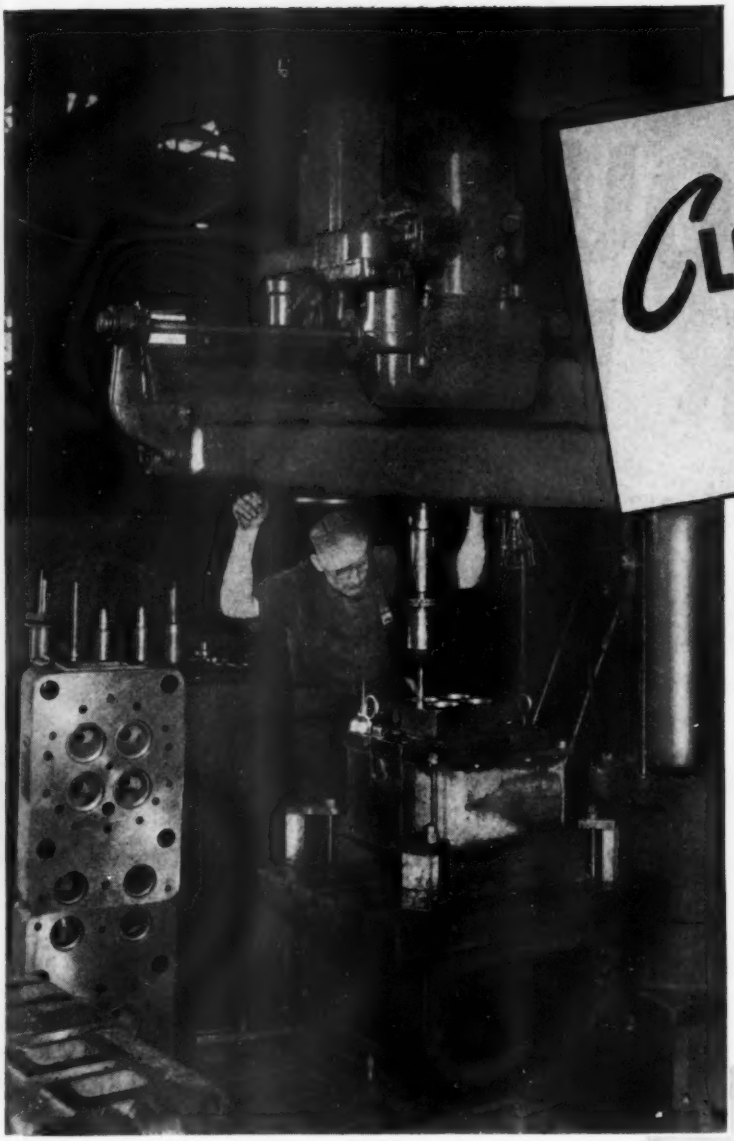
The time-saving versatility which enables South Bend Lathes to handle so many exacting precision operations in essential war industries will be a pertinent profit-making factor when normal production is resumed. The ease and speed with which the lathe can be changed from one set-up to another, and the special attachments available to broaden the range of work, save time and reduce labor costs for the plant that has a variety of precision lathe operations to perform.

South Bend Lathes have a wide range of spindle speeds and power feeds. Full quick change gear mechanism permits instant selection of any thread cutting feed, power turning feed, or power facing-feed. Convenient, quick acting controls and easy reading graduations contribute to smooth lathe operation and efficiency.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swings. Precision Turret Lathes are available in two sizes: ½″ and 1″ collet capacity. Write for new Catalog 100-D giving full descriptions of all lathes.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET · SOUTH BEND 22, INDIANA · *LATHE BUILDERS FOR 39 YEARS*



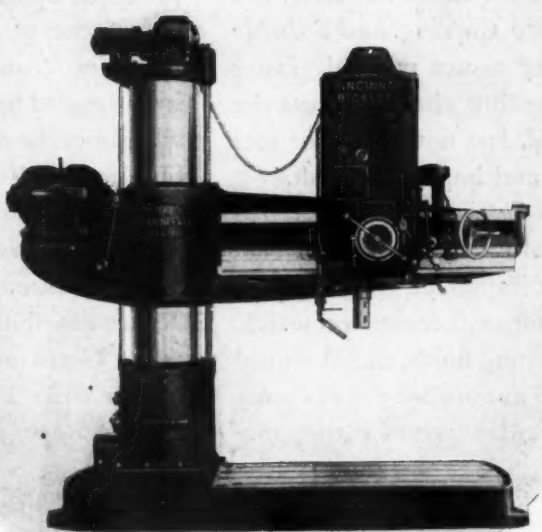
CLOSE TOLERANCE WITH EASE!

The Cooper-Bessemer Corporation says: "The seats for the valves in the Cylinder Head must be smooth and accurate, and this operation is being done very satisfactorily on a Cincinnati Bickford 4' Radial Drill Press. The four valve holes are machined complete in 3.6 hours and held to a tolerance of plus or minus .0005", which includes drilling, rough and finish boring, counterbore and radius. This work is being done with ease by the operator and is free from trouble."

Write for Bulletin R-24A.

See our condensed Catalog in Sweet's File

This Cincinnati Bickford Super Service Radial Drill is maintaining both close tolerance and speed on this exacting job.



RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

MORE OUTPUT BETTER FINISH

when you use cutting fluids that . . .

- ★ Lubricate the tools
- ★ Carry away heat
- ★ Prevent chip welding
- ★ Assure higher speeds and feeds
- ★ Prolong tool life

TO GET *all* these benefits, use *Texaco Cutting and Soluble Oils*. They assure not only faster machining, but also more cuts per tool grind, less downtime for tool changes, and improved finish.

Texaco Cutting and Soluble Oils are typical examples of petroleum products improved through The Texas Company's constant research. Texaco cutting fluids, each designed especially to improve the efficiency of a particular type of cutting, are produced by modern Texaco methods in one of the world's largest refineries . . . and absolute uniformity is assured by skilled technicians who supervise every step of production from well to finished product.

The services of a Texaco Engineer specializing in cutting coolants are available through more than 2300 Texaco distributing plants in the 48 States. Get in touch with the nearest one, or write The Texas Company, 135 E. 42nd St., New York 17, N. Y.

RECONVERSION RUSTPROOFING

4 Points to Remember

1. Ordnance Specification P. S. 300-4 contains *official instructions* for the complete processing of Government-owned production equipment.
2. These instructions require that only rustproofing materials meeting Government specifications be used.
3. *Texaco rustproofing products meet Ordnance specifications for application on Government-owned equipment.*
4. For full information, see your Texaco representative or write to us.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT — CBS

Surplus Machine Sales

WASHINGTON is showing signs of getting down to business in the disposal of surplus government machine tools and other production equipment.

After a three-man Surplus Property Board proved unwieldly, inharmonious and inefficient in determining general policies, the law was changed to permit appointment of a single administrator.

That appointment has been made. The new set-up will eliminate confusion and bring about more orderly procedure, quicker decisions and better management.

The Reconstruction Finance Corporation is to be praised for establishing a chain of sales offices from coast to coast. Within a short time a national system of listings will be completed whereby a buyer, no matter where located, can learn from the nearest RFC regional office what machines are available anywhere in the United States.

This national inventory is a first step toward making known to the buyer what he wants. At least we shall know exactly what we have on hand at any designated time. Up to now we have been in the dark.

Use of experienced machine tool dealers to help sell surplus tools is a sensible procedure now being seriously considered. By contrast with RFC representatives who possess no working knowledge of machine tools, the dealers are intimately acquainted with machine shops and machine practices and will be able to aid notably in choosing the right surplus machine for the right job.

After the First World War, large quantities of American tools were dumped abroad without effective guarantees regarding their condition and performance possibilities. Those transactions harmed our export trade for many years and even today they have not been forgotten.

The best possible safeguard against a repetition of that reprehensible action is to lay down a rule that all surplus machines intended for export are to be checked by the original builder, and rebuilt if necessary and desired. In that way the reputation of the maker will be protected and the buyer will be assured of fair treatment.

The surplus disposal law is still cluttered with intricate procedures that interfere with speedy sales of machines. Special-named classes of prospective purchasers must be given preference instead of selling tools to the first comer. But the friends of orderly and quick surplus disposal agree that it is wise not to tamper with the law at present. Attempts to change it might result in worse legislation. The saving grace at the moment is the fact that surpluses are so abundant that all classes of buyers will be able to get what they seek.

A surprisingly large volume of very old machines is coming onto the market in connection with surplus disposal. These machines, as against the usefulness of the newer and more modern types, are a drag upon the country's metal-working economy. Instead of being put back into circulation in industry, these older machines should be scrapped by RFC.

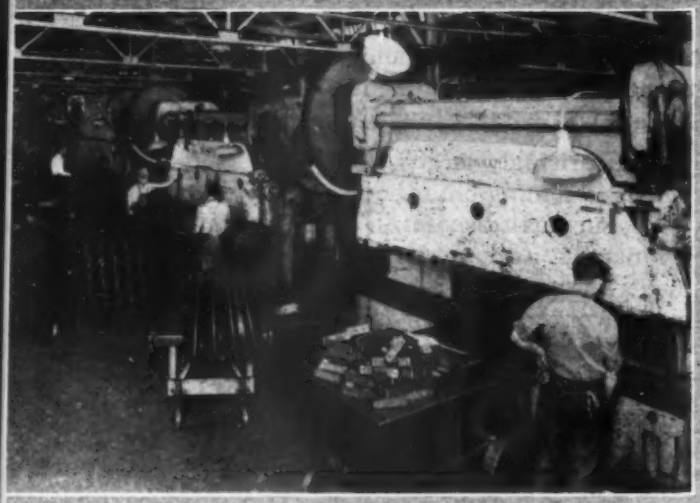
The best time to sell surplus machines is in the next six months to a year. That is why they will aid reconversion and will contribute the most to the making of peacetime jobs. From then on they will be an increasing threat to the machine tool industry and to our entire economy.

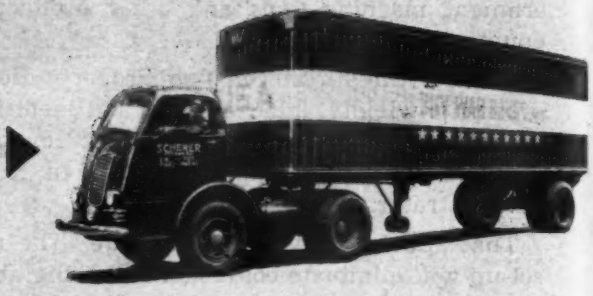
Time is short and every opportunity should be seized upon to sell surplus machines speedily and with the least possible red tape wrapped around sales transactions.

Burnham Finney

"TRAILBLAZERS"

Grow on this line . . .





Long line! Long parts! Short time! That is the nutshell story of Trailblazer production. Nearly a tenth of a mile of Shears and Brakes meets this intensive production problem. This team of Cincinnati Shears and Cincinnati Press Brakes, with their accurate performance and ample working lengths, smoothly and economically handles the long pieces required.

Write us on your shearing and forming problems. A complete Shear Catalog, No. S-4, and Brake Catalog, No. B-2, are available on request.

• *Photos: Courtesy of Trailmobile Co.*

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Simplified Tools Designed For Broaching Spline Forms

BY H. H. GOTBERG, CHIEF ENGINEER, COLONIAL BROACH COMPANY

SPLINE FORMS, in various styles and numbers of splines, have been used extensively as connecting media. For many years the straight-sided spline had the field pretty much to itself, being used extensively in automotive transmissions, machine tools, and various applications where a driving medium is required. In most cases these splines were of the free-fitting type where accuracy and bearing were not of vital importance.

Today, spline connections cover much broader applications and more importance is generally placed on obtaining a high degree of accuracy. As a result, involute splines have become increasingly popular and offer such advantages as:

Involute splines gain favor as requirements call for stronger and more accurate connections. Design of broaches and methods of spline production outlined

Improved and economical manufacturing conditions.

Increased shaft strength.

Increased strength, because of larger area at bottom of spline.

Better contact under load.

Elimination of sharp corners.

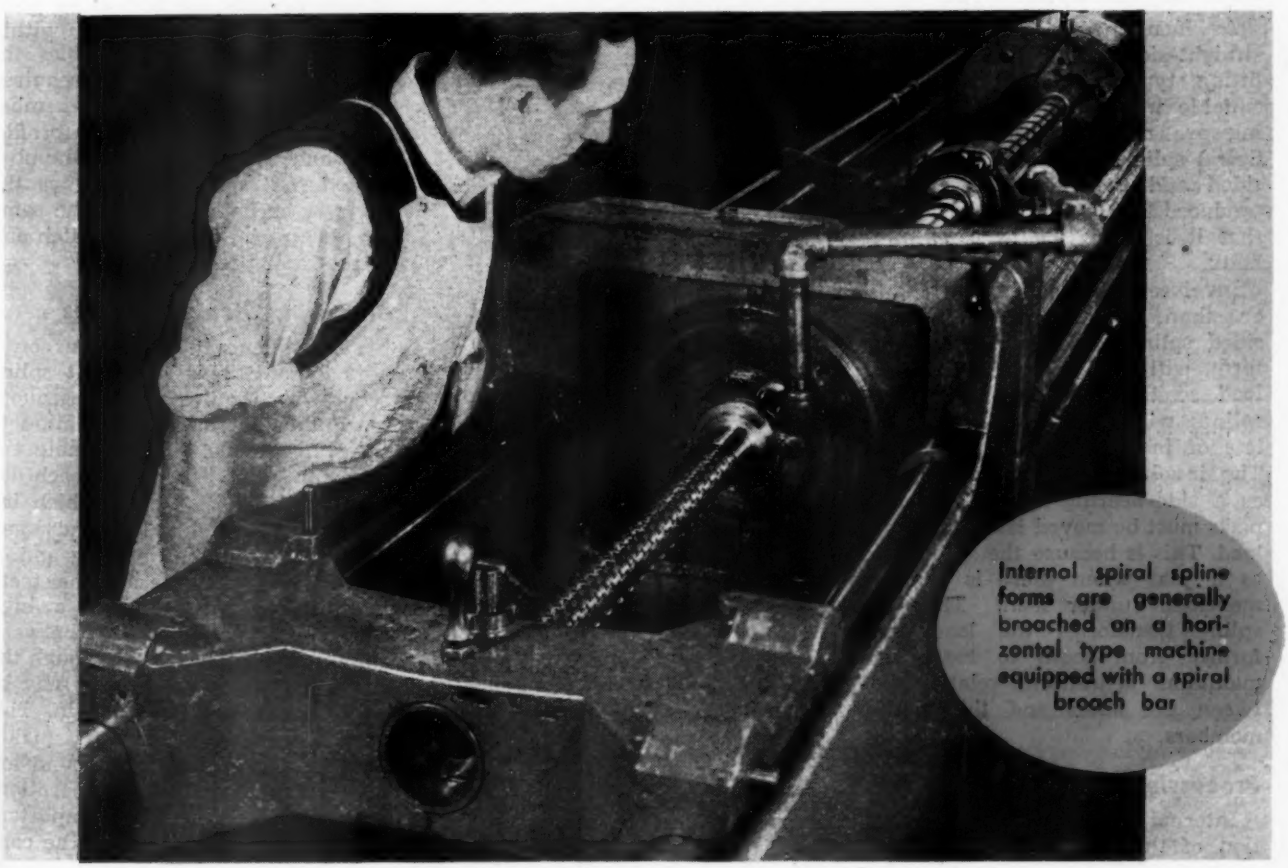
Less depth required.

Equal load distribution.

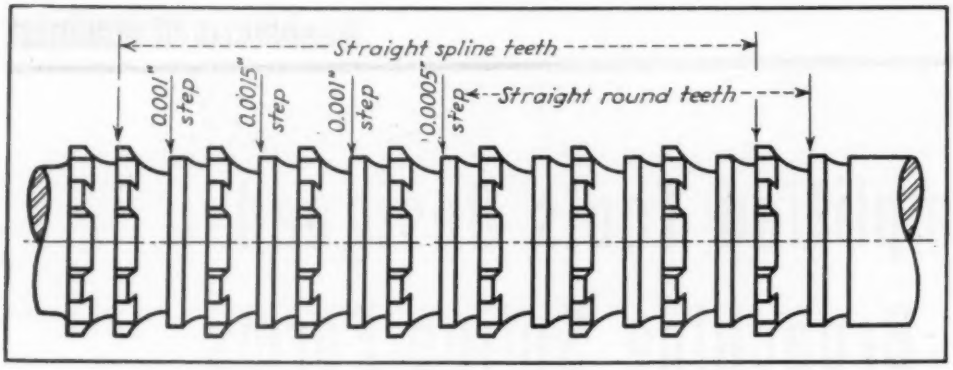
Less tooling.

Simplicity of inspection.

The efficiency of any spline con-



Internal spiral spline forms are generally broached on a horizontal type machine equipped with a spiral broach bar



To eliminate the need for spline arbors, for subsequent machine operations, a broach has been designed with alternate round and spline teeth on the finishing end of the tool

nection is measured by the ratio of the actual spline contact to the total area of all the splines used in the fitting. The accuracy to which splines can be produced as to spline width, spline spacing and form, depends largely upon the manufacturing facilities available. For instance, in producing a 16-spline fitting, the accumulation of errors in spline width, spacing and form, may mean that only four of the splines have adequate bearing surface contact, reflected in only 25 percent efficiency on the basis of side bearing load strength. This may not be serious in many applications, provided a sufficiently high safety factor in load strength is allowed to meet such conditions.

Selecting the Spline Type

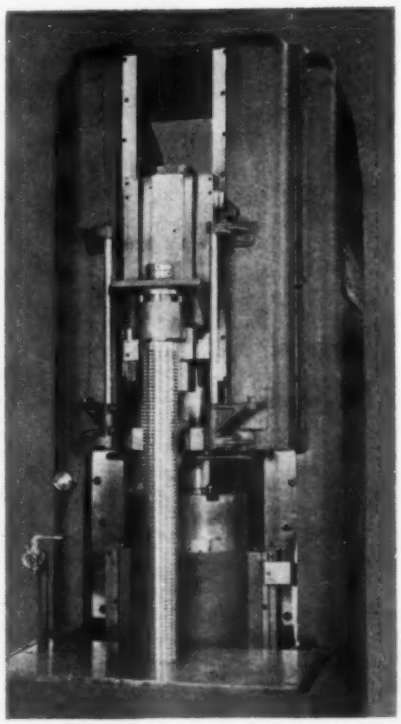
As mentioned previously, many straight-sided splines are of the free fitting type and are particularly suitable where accuracy and bearing are not of vital importance. Spiral splines of both the straight-sided and the involute types are produced like straight splines except that it is necessary to generate a helix.

Involute splines are much stronger than corresponding straight-sided splines, and, being of radial form, will tend to centralize under load so that not less than three splines will be in contact, regardless of inaccuracy of manufacture. The involute spline functions best as a side-bearing spline if mating parts must be moved laterally under load. This is because the splines act as a gear when there is endwise movement under load. Thus the spline transforms the load uniformly from tooth to tooth and maintains a uniform relation between the shaft and the mating members.

Processing Splines

Internal splines, with the exception of the "dead-end" spline, are generally produced by broaching. A "dead-end" spline does not carry through the entire length of the part but has a shoulder at the bottom of the spline which usually has a hole smaller than the I.D. of the spline hole, or possibly no hole at all. In such cases some type of shaper cutter is used. In many instances, however, the shaping operation is not accurate enough to maintain required tolerances and control chordal thickness and spacing error. Here it has been found that a swage-type pocket broach is useful in maintaining the required limits.

For the manufacture of external splines—particularly the involute type—broaching has been applied successfully, although on a more limited scale. External splines are usually produced by hobbing or milling, and occasionally by shaping. Where a spline produced by hobbing, milling or shaping must have a high degree of accuracy supplementary shaving operations are necessary. This is particularly required for involute splines used in connection with a running gear. When it becomes necessary to use hardened shafts with external splines, the sides of the splines (both involute and straight sides) and the O.D. are sometimes finished by grinding.



Broaching a straight involute spline in a propeller hub is accomplished by a pull-down broaching machine

A hob having straight-sided teeth is used to produce involute external splines. This makes it simple to check hobs for accuracy and to check multiple hobs for uniformity. It also permits the hob to be positioned at any desired location within the tooth space. This enables the tooth to be sized in any required relation to the mating member without changing the spline profile. One hob can produce any number of external splines as long as the parts to be hobbed are of the same circular pitch or diametral pitch and of the same pressure angle.

Broaching Straight Splines

The sequence of operations on a part is sometimes such that spline arbors are required for subsequent machining operations in relation to the splined hole. To eliminate the need for spline arbors, a broach design has been developed which incorporates alternate round and spline teeth on the finishing end of the broach. Alternating the teeth in this manner maintains a high degree of concentricity between splines and the I.D., even though the limits on the finished parts may be as much as 0.010 to 0.020 in. This particular type of broach makes possible the use of plain round arbors for the machining operations which follow. Where it is important to maintain close limits on the con-

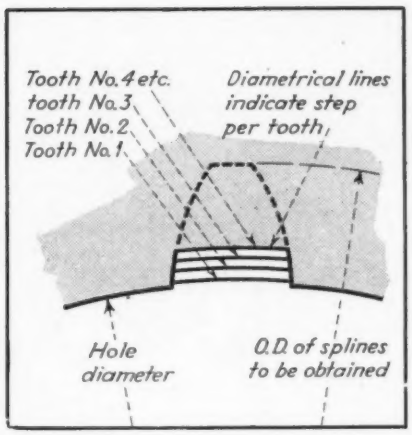
centricity of the I.D. and O.D. of the splines, a broach of this design will assist materially in meeting specifications.

Regardless of its design or type, every broach exhibits some tendency to drift. Usually the drift is very slight and in the majority of cases passable parts are produced. When the limits must be held as close as 0.001 in. or less on both the I.D. and the O.D., and these limits are of functional importance in the assembly of the component parts, it is best to use a broach of alternate tooth design. This eliminates any possibility of the broach drifting beyond the required limits.

A certain amount of distortion takes place in parts which must be heat treated after the splining operation has been completed. To correct this condition a sizing broach, classed as a "Hard Gear" broach, may be used. This broach derives its name from the fact that this operation is usually required on gears in which the teeth on the O.D. are hardened to high Rockwell readings.

If the outside gear teeth are to be hardened to more than C-40 Rockwell, the splines should be "painted" or packed to prevent the metal at the splines from exceeding this hardness. While splines hardened to a higher Rockwell reading have been successfully re-broached it is not recommended practice, and tends to decrease tool life.

Sometimes, when a broach is put to work—especially an involute broach held to a tolerance of 0.0005 in. or less on the chordal tooth thickness—it will at first produce parts which will permit a "Go" gage to enter while the "No Go" will not enter. After several broaching operations the heat generated in the broach is such that the "No Go" gage will also enter the parts.



From the cutting action shown it will be seen that it is not possible to incorporate side relief over the entire length of the spline-cutting sections of the broach

Where tolerances are sufficiently close to make heat expansion a problem two passes should be used. The first pass broach should leave approximately 0.010 to 0.020 in. of stock on each side of the spline. Then, if the parts are permitted to cool between the first and the second passes, the heat generated by the second pass of the broach usually is not sufficient to result in material expansion of the broach.

Broaching Spiral Splines

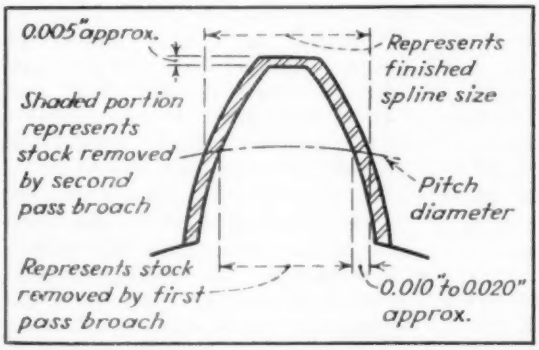
In producing a splined spiral shaft the amount of helix angle which can be developed is not limited, since hobbing or shaping equipment can be geared to produce steep helix angles. In broaches, however, there is a somewhat more difficult problem. In the grinding of spiral spline broaches master lead screws are used. The master bar is driven by horizontal motion in the direction of its longitudinal center line. As a result of this technique the helix angle is somewhat limited since, on excessive angles, the side thrust becomes too great to rotate the bar. Satisfactory broaches with a helix angle of approximately 60 deg. or more from the horizontal center line (depending upon the diameter of the broach), have been produced.

Actual spiral spline broaching is similarly affected. It is usually necessary to rotate the broach by mechanical means, especially when the helix angle exceeds about 15 deg. This is usually done by clamping the part rigidly to a face plate on the machine and rotating the broach by means of a helical drivehead actuated by a master spiral lead bar.

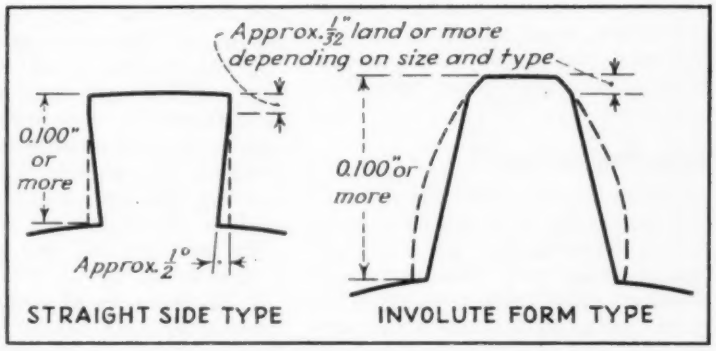
Broach Design

When broaching internal splines of considerable depth, the sides of the splines exhibit a tendency to pick-up or gall. This is overcome by relieving tooth sides on those broaches having a spline depth of 0.100 in. or more, on both the straight and the involute type of spline broach. The broach cut is generated outward from the hole diameter by diametrical increments of each successive tooth and it is not possible to relieve the tooth sides of spline broaches less than approximately 0.100 in. deep because of the difficulty in reaching shallow depths with a grinding wheel. However, pickup and galling are seldom experienced on such shallow cuts.

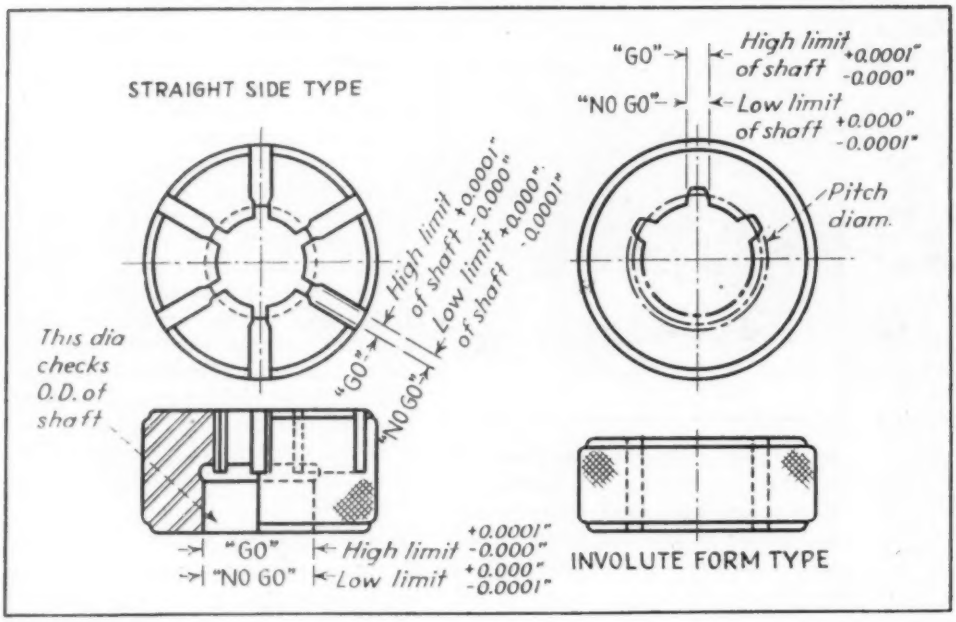
Relieving the sides of the splines sometimes causes the broach to drift slightly while it is being pulled through the part. On jobs where extremely close limits are mandatory, and especially on involute splines, side relief is sometimes omitted. In such cases, extreme care is necessary in making the broach. On such broaches a special


0.005" approx.
Represents finished spline size
Shaded portion represents stock removed by second pass broach
Pitch diameter
Represents stock removed by first pass broach
0.010" to 0.020" approx.

Where accuracy required is such that expansion becomes a problem two passes of the broach are recommended, the first pass leaving approximately 0.010 to 0.020 in. of stock


Approx. 1/32" land or more depending on size and type
0.100" or more
Approx. 1/2°
0.100" or more
STRAIGHT SIDE TYPE
INVOLUTE FORM TYPE

To overcome galling or pick-up it is good practice to relieve tooth sides on those broaches having a spline depth of 0.100 in. or more, whether of the straight or involute type. Pick-up seldom occurs on shallow cuts



Spline ring gages for checking straight side splines employ open end construction and check the O.D. of the shaft, the spline width and the spacing error

Tool life may be extended by applying these specifications to gages for both straight side and involute straight splines as well as to spirally broached splines

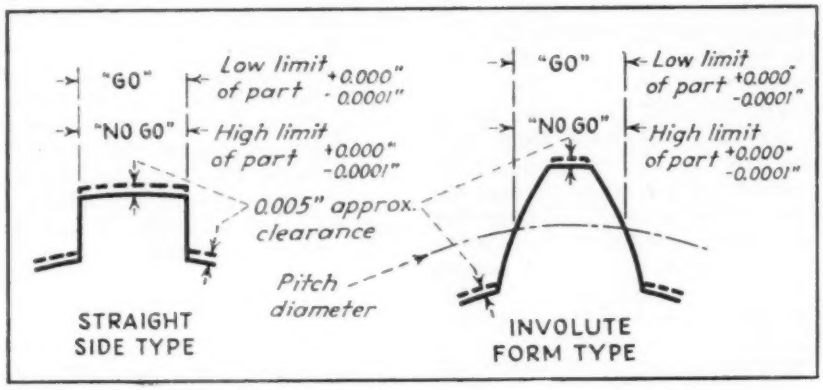
heat treating operation can be applied after the broach is completely finished, producing a higher surface hardness which helps eliminate pick-up and galling.

In rare instances it has been found that where very close tolerances on spline width are specified, the user had actually withheld the total tolerance and had specified less tolerance than is really allowable in order to be sure that the tools would be well within the limits of accuracy required. This procedure does more harm than good since, when an extremely close tolerance is given, the designer as well as the broach grinder are instructed to hold the spline width as close to the high limit as possible so that the tool will not cut undersize.

When a tolerance of 0.0005 in. is actually permissible, and instructions are given that a 0.0003-in. tolerance must be held, the chances are that the broach will tend to cut oversize. If the 0.0005-in. tolerance had been submitted, enough leeway could have been given to assure holding to the correct tolerance as given on the part print specifications.

Inspecting Splines

Inspection gages frequently differ from the gages used in actual production departments. That is, production gages are held to closer tolerances than inspection gages to permit salvaging of parts which are not passable by the production gages. When such a procedure is followed, it is suggested that the actual desired dimensions be submitted to the gage manufacturer rather than the master gages which are to be copied. Master gages may vary dimensionally from time to time, making exact reproduction difficult.

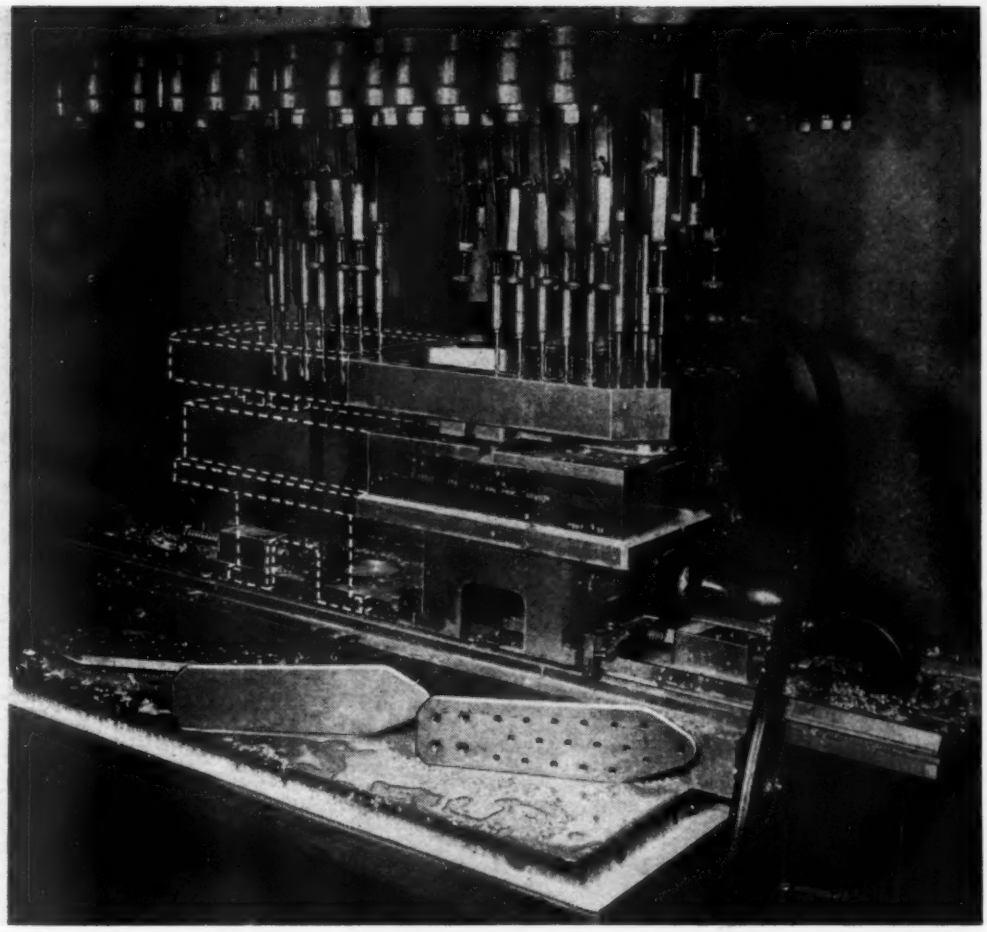


Spline "Go" gages are generally designed to allow for clearances on the O.D. as well as on the hole diameter, as the primary purpose is to check the width of the spline and also to check for possible spacing errors. The spline width on the "Go" plug gage is held to the low limit of part specifications with a minus 0.0001-in. tolerance. "No Go" plug gages are usually designed to allow for clearance on both the O.D. and the I.D. with the spline width held to the high limit of the part print specifications, and a tolerance of plus 0.0001 in.

It has been found that specifying these tolerances allows for maximum tool life on broaching tools. These specifications apply to gages for both straight-side and involute straight splines as well as to spirally broached splines. The length of spline plug section should duplicate the part length as nearly as possible to insure that the splined hole will be straight through the entire length of the part. Spline ring gages of the straight-side type are of open end construction and can be made to check the O.D. of the shaft as well as spline width and spacing error.

The involute type gage is solid because it must be either broached or shaped and then lapped or ground. Involute types are designed with clearances for both O.D. and I.D. of the spline. However, tolerances on the spline width and chordal thickness are the same in either type of ring gage. "Go" gage spline width is held to the high limit of the shaft with a plus 0.0001-in. tolerance. "No Go" gage spline width is held to the low limit of the spline shaft with a minus 0.0001-in. tolerance.

A more practical approach to specifications covering splines will be found to be more in line with manufacturing costs on a peacetime basis.



Mounting of a pump-type drill jig on the rails of a baseplate has sped the two-position drilling of aluminum aircraft parts. Adjustable stops at each end of the baseplate insure accurate location of the jig for each of the drilling operations. Dotted lines show positioning of the workpiece for the second drilling operation

Aluminum Alloy Parts Drilled With Two-Position Set-Up

BY CHARLES H. BODNER, TOOL ENGINEER, LOCKHEED AIRCRAFT CORPORATION

THE TWO-POSITION drill jig set-up illustrated is used to drill 20 to 25 holes in five similar aluminum alloy parts at the Burbank plant of the Lockheed Aircraft Corporation. A steel baseplate with inverted V-rails is mounted on the table of a Natco multiple-spindle drill press and is held in place by two large C-clamps. On this baseplate are two adjustable stops which locate the Swartz pump-type jig for the two drill stations, which are necessary because of the relatively large number of holes that must be drilled in an area too small to accommodate all of the adjustable drill spindles required for these parts. For the part shown, 22 spindles are required; 14 holes are drilled in the first position, at the right, while eight holes are drilled in the second position at the left.

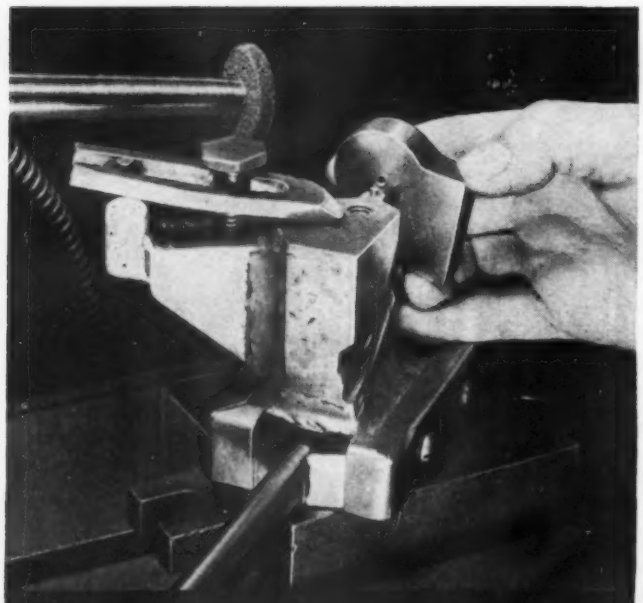
This time-saving arrangement was originated by the supervisor of the drilling section. Its use is credited with stepping up production of these parts from 60 pieces in 8 hr. to 300 pieces in 8 hr., a five-fold increase. This increase in production also applies to the other four similar parts, each of a different size with a different hole pattern.

A separate drill plate and locating plate have been made for each of the five different parts. Any one of these sets of drill plates and locating plates can be mounted in the drill jig in a matter of five minutes or less, since each locates from standard dowel pins and is held in place with socket-head cap screws.

After the original set-up was completed for each part, a piece of ½-in. thick Masonite was clamped in the jig, in place of the part, and drilled. It then was painted and laid aside as a set-up templet. This simplifies resetting the drills for each production lot and reduces set-up time materially. For the set-up shown, the operating cycle requires a total of 1½ min. to load, drill at the first position, shift to the second position, drill and unload.

Universal Fixtures SIMPLIFY RADIUS LIP GRINDING

BY ARTHUR CUPPET,
JOSHUA HENDY IRON WORKS

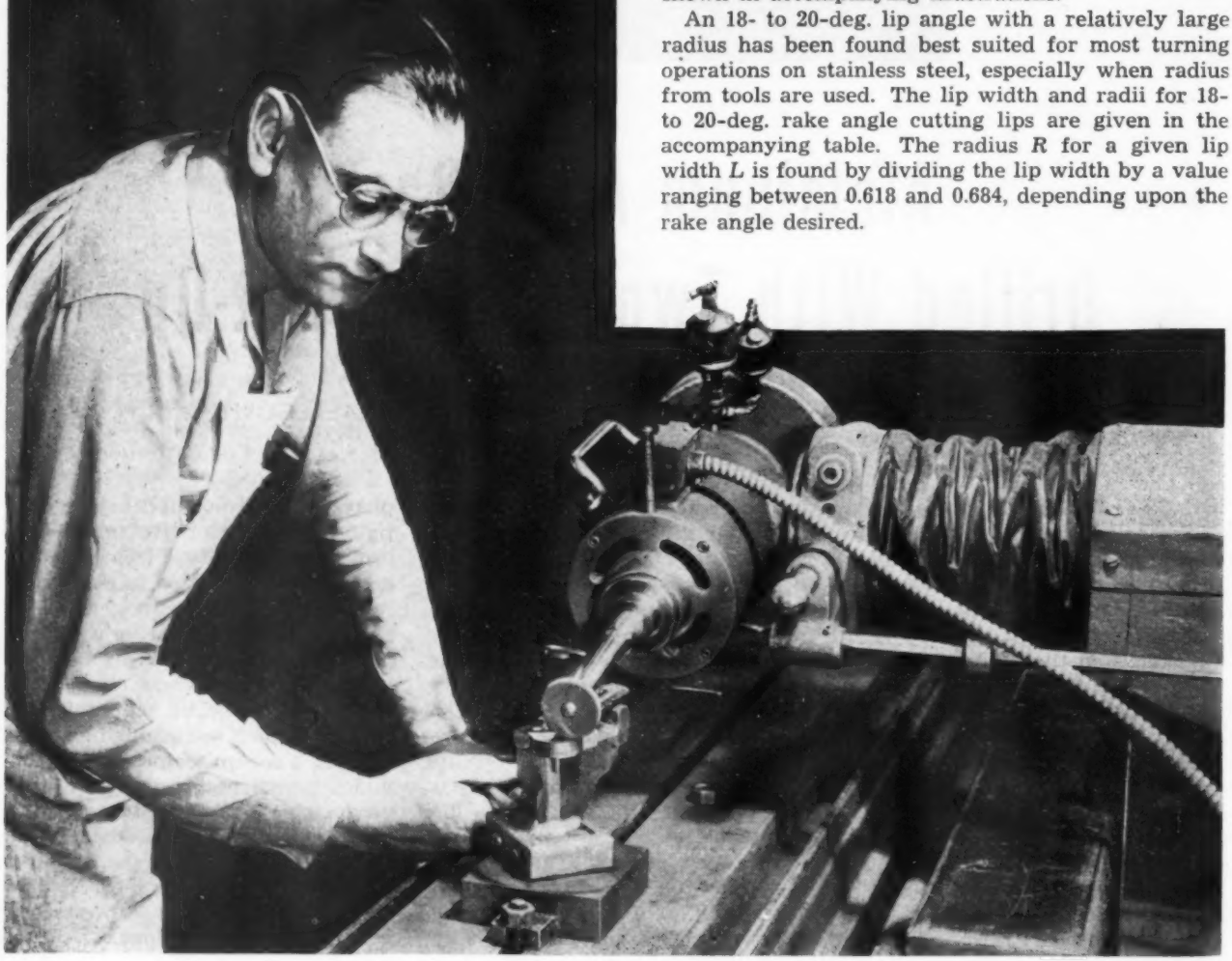


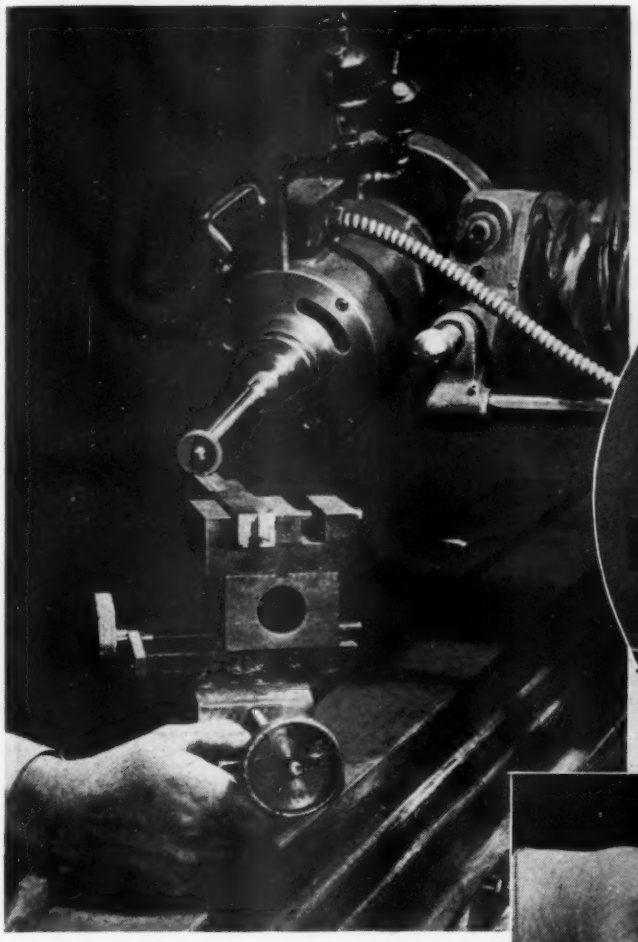
TOOLBIT LOCATION — Accurate location of the toolbit is from a pin, which is in line with the vertical axis of the fixture and on its top surface. A wide range of toolbits may be readily clamped on this fixture

RADIUS LIP GRINDING — After clamping, the wheel spindle of the grinder is inclined 18 to 20 deg. and the fixture is turned about its vertical axis by a handle until the face of the tool is properly radiused

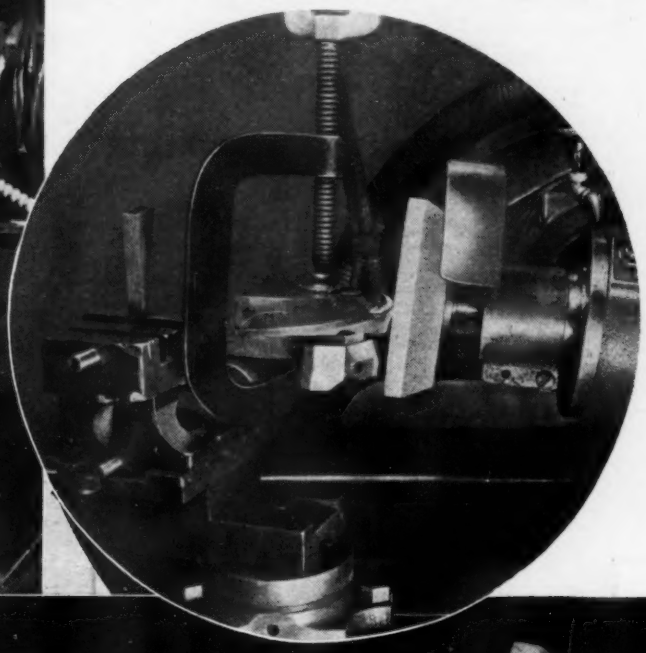
RADIUS-LIPPED high-speed steel tools are used for many turning operations on high-tensile strength alloy steel and stainless steel parts at the Sunnyvale plant of the Joshua Hendy Iron Works. Without special fixtures, the accurate sharpening of these tools is a difficult matter. These sharpening operations have, however, become routine since the development of simple fixtures for use on an Ex-Cell-O tool grinder. Set-ups which have proven satisfactory are shown in accompanying illustrations.

An 18- to 20-deg. lip angle with a relatively large radius has been found best suited for most turning operations on stainless steel, especially when radius from tools are used. The lip width and radii for 18- to 20-deg. rake angle cutting lips are given in the accompanying table. The radius R for a given lip width L is found by dividing the lip width by a value ranging between 0.618 and 0.684, depending upon the rake angle desired.

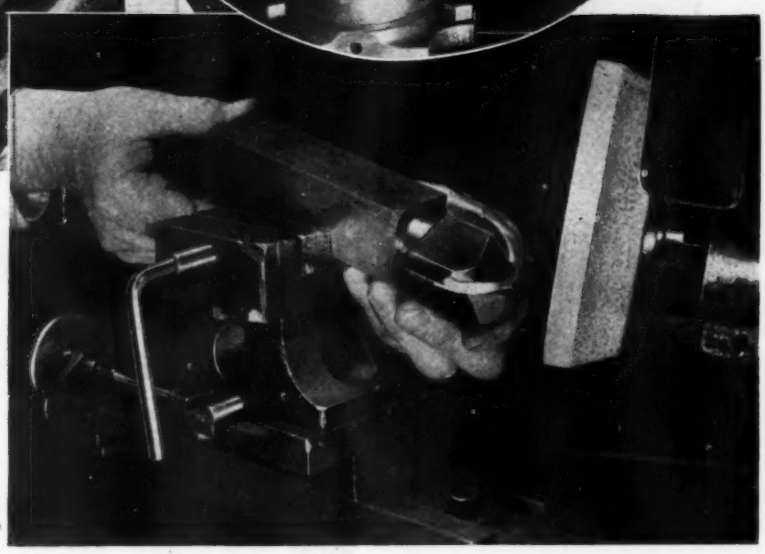




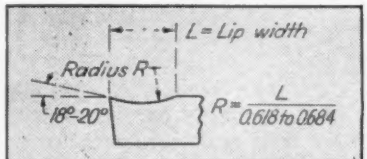
RELIEF ANGLE GRINDING—After the radius lips have been ground, a cup wheel on the other end of the grinder spindle and set at an angle, as shown, provides relief and clearance angles on the radiused cutting edge of the form-turning tool



STRAIGHT EDGE GRINDING—To grind a radiused lip along a straight cutting edge a fixture with longitudinal and transverse screws is used and, with the wheel set at an angle with the lip, the tool is fed longitudinally

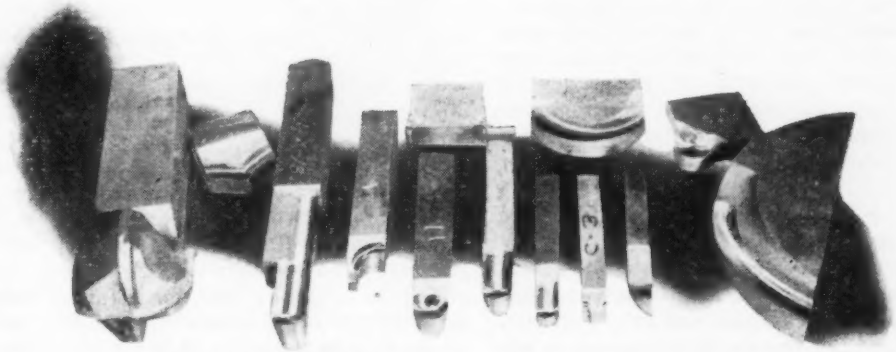


MULTI-LIPPED RADIUSING—Relief and clearance angles on multi-lipped ball-nose milling cutters, held in steel blocks, are ground as shown. For the radiused faces the fixture is moved to the other end of the machine and set up under a smaller wheel

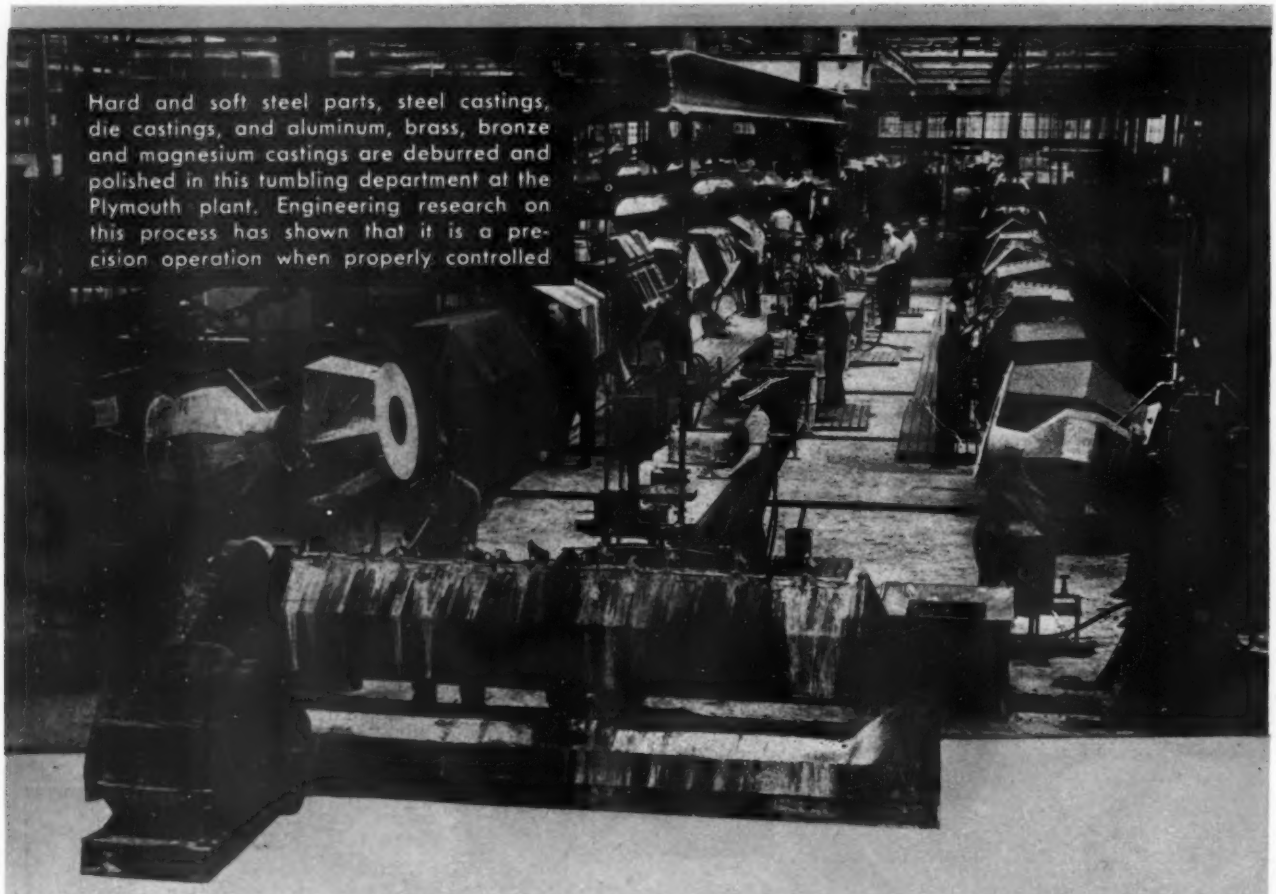


L	R	L	R
1/8	3/16	11/16	1 1/16
3/16	9/32	3/4	1 1/8
1/4	3/8	13/16	1 5/16
5/16	1/2	7/8	1 3/8
3/8	9/16	15/16	1 1/2
7/16	11/16	1	1 9/16
1/2	3/4		
9/16	7/8		
5/8	1		

Radii for 18 to 20 deg. rake angle cutting lips



LIPS OF ANY SHAPE—These tools illustrate typical variations



Hard and soft steel parts, steel castings, die castings, and aluminum, brass, bronze and magnesium castings are deburred and polished in this tumbling department at the Plymouth plant. Engineering research on this process has shown that it is a precision operation when properly controlled

Controlled Barrel Burnishing Action Imparts Precise Finish to Metal Parts

DEBURRING and polishing metal parts with granite chips in rotating barrels is a precision operation when properly controlled. It requires considerably less time for the same production quantities and is much less fatiguing than hand filing and polishing operations. These facts have been proved in a production tumbling department set up some time ago in the main plant of the Plymouth Division of the Chrysler Corporation as a part of its manufacturing procedure for making Bofors 40-mm. anti-aircraft guns for both the Army and the Navy. In this department granite chips are used for deburring and polishing hardened steel, soft steel, bronze, aluminum and magnesium castings and die castings, and it is expected that the process will be used to advantage in the manufacture of parts for automobiles and other peacetime products.

Deburring and polishing parts using wood-lined barrels and granite chips resulted in the elimination of hand-finishing

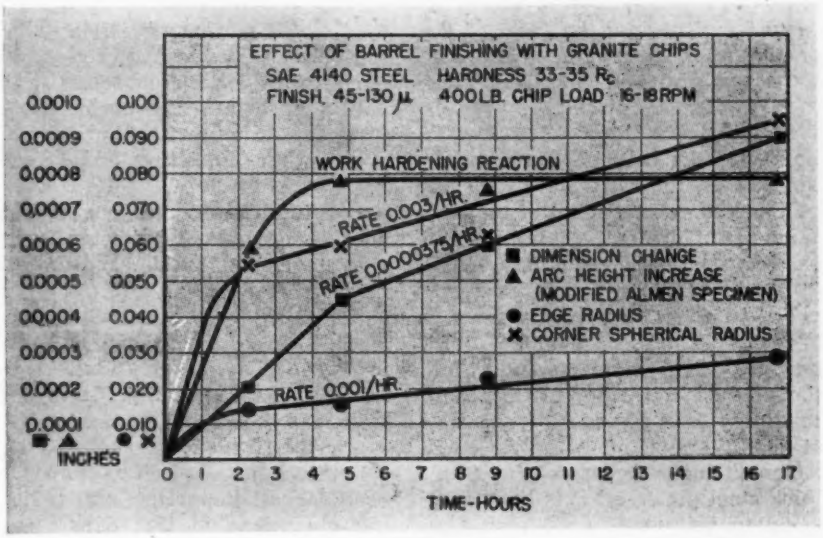
The finishing of precision machined gun parts in a tumbling or burnishing barrel was at first considered impractical, because if there should be any distortion it would be impossible to use the part in a gun assembly. However, to test the process a 55-lb. cast bronze side frame for a Bofors was placed in a large barrel approximately half full of small granite stones. After a few revolutions of the barrel, the doors were opened and the part carefully examined. Several scratches and severe cuts were noted, so the next step was to try to tone down the cutting action. The barrel was filled with water sufficient to cover the stones and the part then was replaced for a run of approximately 30 min. Upon removal, it was found that the scratches and cuts previously noticed had been almost completely polished out and all the sharp edges were gone. This part then was passed along to the inspection department in the usual way and, as expected, the part was immediately rejected because of definite radii requirements.

The part was again placed in the barrel, the speed of the barrel was reduced and the length of tumbling time extended to approximately 2 hr. Then the part was removed and

after washing was found to be far superior to products previously hand-finished. Rigid laboratory tests revealed that the processing did not harm the part.

A large experimental barrel was built and various finishing compounds and abrasives were used to determine the proper processing procedure for each size and shape of part. Caustic soda was used to prevent rusting of steel parts and various cleaners and compounds were used as polishing agents. From this experimental work a recommended procedure was developed for each part and charts were placed at the tumbling barrels to specify the proper amount of compounds, stone capacity, length of tumbling time and barrel speed required to get the best possible results on each part.

Several different types of barrels now are used for barrel deburring and polishing operations in the Plymouth plant. Open-end pear-shaped hexagonal steel barrels are used for experimental work when determining the proper processing procedure for a new part and for removing heat-treat scale from small parts. These open-end barrels have ⅜ in. thick steel walls and are lined with 2-in. thick knotty yellow pine. The larger try-out barrels for experimental work measure 36 in. across flats inside the wood lining. They are tilted as nearly horizontal as possible and a lip inside the flat cover on the open end of the barrel guides the solution back to the bottom of the pool.


EFFECT OF BARREL FINISHING WITH GRANITE CHIPS
SAE 4140 STEEL HARDNESS 33-35 Rc
FINISH 45-130 μ 400 LB. CHIP LOAD 16-18 RPM
WORK HARDENING REACTION
RATE 0.003/HR.
RATE 0.0000375/HR.
RATE 0.001/HR.
DIMENSION CHANGE
ARC HEIGHT INCREASE (MODIFIED ALMEN SPECIMEN)
EDGE RADIUS
CORNER SPHERICAL RADIUS
INCHES
0.0010 0.0009 0.0008 0.0007 0.0006 0.0005 0.0004 0.0003 0.0002 0.0001
0.100 0.090 0.080 0.070 0.060 0.050 0.040 0.030 0.020 0.010
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
TIME-HOURS

Studies made by the Chrysler Engineering Department on hardened steel samples indicate that the rate of finishing is greatest at the start of the process, and that it becomes slower and slower as the process is continued. After about 20 hr. no further effect is noticeable

Open-end barrels are used when developing the tumbling process for a given part. Size of granite chips, number of parts per load, speed of barrel rotation and amount of abrasive required for each load is easily determined by this method. The process is similar to that used for burnishing parts prior to plating in many finishing plants, except that granite chips are used instead of hard steel shapes

Action inside of the barrel can be watched at all times, because of the open end, and the workpieces can be removed and examined frequently. This makes it possible to determine easily the proper length of time for processing a given part at various speeds. Smaller barrels of the same general design are used for removing heat-treat scale from small forgings or castings. These barrels measure 24 in. across flats inside the 2-in. wood lining and are rotated at 28 to 30 r.p.m.

Barrels Lined With Wood

Large multi-compartment horizontal-axis barrels, developed by production and process engineers, are used for production deburring and polishing. They have a ⅜-in. thick hexagonal welded steel shell 80 in. long between end plates and measure 40 in. across the heaxagonal flats. These shells are supported on trunnion shafts bolted to the ½-in. steel and plates. Each of the shells is lined with 2-in. thick knotty yellow pine, which is assembled dry in the shell and then soaked with water to swell it into place.

Two standard barrels have been developed, one with three compartments and the other with four compartments. A 1½-in. thick seasoned maple partition separates each of the compartments and a similar lining is assembled as a facing on each of the barrel end plates inside the circumferential wood lining. These end linings and the compartment partitions have 1½-in. diameter hickory dowels on 3½-in. centers extending

½ to ¾ in. beyond the faces of the partitions on each side to increase the life of the partitions. This gives the partition walls approximately the same wear life as the sidewall linings of the barrels. Before using the dowels, the sidewalls had a life of about three times that of the partition walls. Now, the sidewalls and partitions last approximately 2½ to 3 months on a three-shift basis.

The four-compartment barrels have four 9 x 12 in. door openings, one for each compartment. Similarly, the three-compartment barrels have 14 x 20 in. door openings at each compartment. Each compartment door is made of ⅜ in. thick steel plate and it is lined with wood to bring the wood facing on the same level as the wood lining of the barrel into which it is fitted. The door seats on rubber against a round bead made of ¼ in. diameter steel rod welded around the door opening in the steel shell of the barrel. Doors are stiffened so that they will not bend under clamping pressure. Hinges have elongated slots so that the doors can be pulled tight against the rubber gaskets to prevent leaks.

Safety Factor in Rotation

Each barrel is individually driven through a variable-speed unit from a 5 hp. electric motor. The horizontal barrels rotate up and away from the operator's position so that the door handle cannot catch in his clothing and pull him under the barrel. Each barrel is equipped with a brake which is interlocked with the switch operating the drive motor. This reduces the time which ordinarily would be required for the barrel to slow down and stop at the end of a run and also permits stopping the barrel with the doors in position for unloading and reloading.

For tumbling some long rods, a special long small-diameter barrel was developed so the rods would not turn end for end while the barrel is rotated. This barrel has two 36-in. long compartments and measures 14-in. across the flats of the hexagonal wood lining. It is used principally for deburring and polishing 28 to 30-in. long steel rods.

Crushed granite chips now are used for all deburring and polishing operations in this department. It has been found best to select the stone size so that individual stones will not catch in holes or slots in the workpieces. They should be smaller than the holes or slots so that they will fall out, or larger so that they will not enter. Blind or tapped holes should be plugged with cork, rubber or headless setscrews. The crushed granite chips have been found to decrease in size approximately one percent in an 8-hr. period.

Chip size determination is based on three fundamental needs, and a variety of sizes can be used in the same charge to satisfy these needs. They are: (1) chips must be small enough to reach every surface to be worked, (2) it is best to avoid sizes likely to wedge in openings, drilled holes or splines, and (3) larger chips cut faster than smaller chips. Chips should be rescreened after use in from one to three charges, depending on the nature of the work, in order to maintain the required sizes. Where no trouble is experienced with chips wedging in slots, holes or other openings, they can be used for a longer time than when such trouble develops.

The mass of chips used in each barrel compartment should be the same whether one piece or a full load of parts are to be processed, and should fill 50 to 60 percent of the compartment capacity for best results. The maximum number of pieces which can be processed at the same time is just under that number at which the workpieces contact each other frequently, rather than remaining separated by the chips.

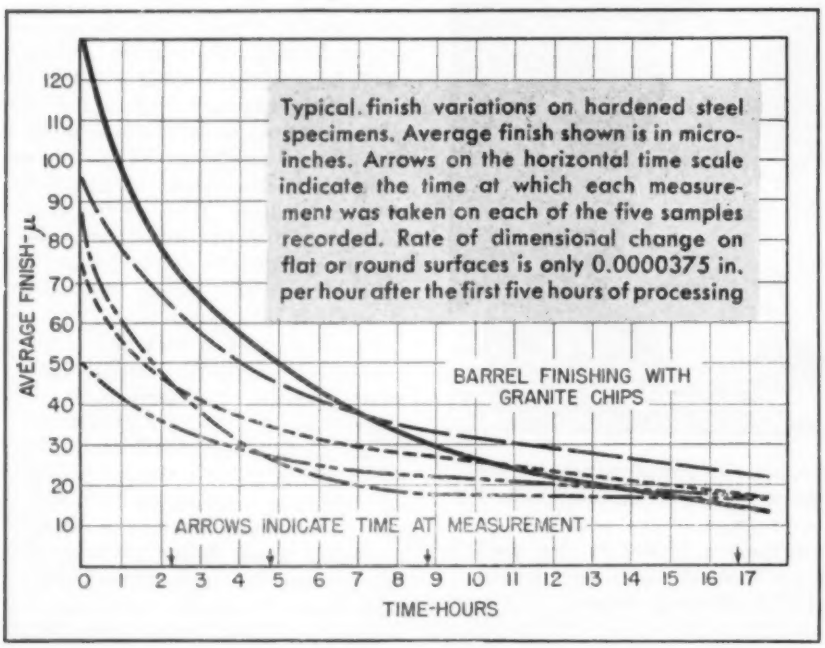
Abrasive Solution Used

In each compartment load, an abrasive (usually about No. 600 grit finely ground silica flour) is added after the stone chips have been thoroughly cleaned. Usually about 1-lb. of silica flour is sufficient for each 100-lb. of granite chips. Sufficient water is added to cover the stones so that the mix is thoroughly wet. If too much water is used, the silica flour floats to the top and weakens the solution. Caustic soda is added in sufficient quantities to prevent rusting of steel parts.

For hexagonal barrels measuring 36-in. across the inside flats, speed of rotation is usually about 12 to 16 r.p.m. when processing steel or bronze parts. Higher speeds can be used for lighter loads and lower speeds are necessary for heavier loads. Time of processing varies with the amount of work to be done on the part and the nature of the material being processed. Some aluminum parts require as little time as 30 min. while steel parts usually require 1.75 to 2 hr.

Studies conducted by the Chrysler Engineering Department on test pieces made from SAE-4140 steel hardened to about 33-35 Rockwell C indicate that the rate of finishing is greatest at the start of the process and that it becomes slower and slower as the process is continued. After about 20 hr. of processing, no further effect is noticeable. The abrasive, such as the silica flour mentioned above, noticeably depreciates after 4 hr. of use and it should be replaced after a maximum of 8 hr. The chief function of this material seems to be to keep the chips clean.

Test samples used were ground flat specimens and 1-in. diameter machined cylindrical specimens. Re-


Typical finish variations on hardened steel specimens. Average finish shown is in microinches. Arrows on the horizontal time scale indicate the time at which each measurement was taken on each of the five samples recorded. Rate of dimensional change on flat or round surfaces is only 0.0000375 in. per hour after the first five hours of processing
AVERAGE FINISH-μ
120
110
100
90
80
70
60
50
40
30
20
10
BARREL FINISHING WITH GRANITE CHIPS
ARROWS INDICATE TIME AT MEASUREMENT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
TIME-HOURS

sults on these specimens show that the effect of the process is lowest on flat surfaces and highest on corners with the effect, rated in their increasing order, being somewhat as follows:

(1) Recessed or internal surfaces; (2) flat surfaces; (3) round surfaces; (4) edges; and (5) corners.

As indicated in the accompanying charts, the corner spherical radius increases rapidly for the first two hours, and then slows down to an even rate of about 0.003 in. wear per hr. of tumbling. The edge radius increases at a much slower rate for the first two hours and then is reduced to a rate of about 0.001 in. wear per hr. Dimensional change on flat or round surfaces is at the rate of approximately 0.0000375 in. per hr. after approximately 5 hr. of processing. Prior to that time, wear is at a more rapid rate. Work-hardening reaction, as measured on modified Almen strip specimens, increases rapidly for the first five hours and then seems to decrease slowly.

The endurance limit on steel parts has been found to increase somewhat after tumbling with granite chips. A fatigue test program is now being carried forward by the Chrysler Engineering Department on certain automobile parts and a longer fatigue life after tumbling now seems evident. Tests carried out on Almen "A" strip specimens indicate that the increase in fatigue life can be evaluated mathematically.

Cleanliness Stressed

Experience with the process has shown that best results depend on cleanliness of work, barrels, chips, abrasive compounds, cleaning apparatus, handling equipment and environment. When cleanliness is lacking, unsatisfactory work with pits and discoloration is to be expected. The workpieces should be cleaned before processing and should be washed, rinsed and dried, and if necessary given a coating of rust preventive oil or other material after processing. A hot water tap should be located above the barrel so that the water may be charged directly into the barrel, or used to wash down the outside of the barrel.

The tumbling procedure for steel parts now being used in actual production is somewhat as follows:

1. Starting with a properly loaded barrel containing clean chips, the barrel is charged by placing the proper amount of silica flour in each compartment and adding sufficient water to cover only the stones. Then, about ¼ lb. of caustic soda is added to each compartment.

2. Place the machined parts in the barrel compartment according to specified procedures.

3. At the end of the correct processing time, remove the finished parts from the barrel and dip in hot water to rinse. Adequate rinsing is essential to insure against leaving a film of silica on the surfaces of the parts. Blow with air to dry.

4. Place unfinished parts in the same solution for the next run.

This procedure is continued for 8 hr. only, at which time (preferably at the beginning of each shift) each barrel compartment is thoroughly cleaned. This is done by first draining away the contaminated solution and refilling with clean water to the previous level. Then approximately 3 lb. of a metal cleaner (No. 5-X or equivalent) is added and the barrel is rotated for approximately 3 min. The barrel compartment then is drained and rinsed thoroughly, and recharged as above.

A contaminated solution tends to leave an oily film over the parts. The barrel should be thoroughly cleaned and rinsed as soon as such a film appears on the finished parts. Tumbling parts without the proper amount of finishing compound (such as silica flour abrasive) causes the stones to become smooth or frictionless, and results in slower processing. For bronze and steel parts where the machining cuts leave heavy burrs, it is best to remove them with a hand-operated rotary burring tool.

Compartmented horizontal barrels are used for production tumbling Bofors gun parts and automobile parts in the Plymouth plant. This 55-lb. cast bronze side frame for a Bofors anti-aircraft gun is finished in 2 hr. when the barrel is rotated at 12 r.p.m. One part is loaded into each of the three barrel compartments

The process as now carried on at the Plymouth plant is more properly termed a barrel burnishing rather than a barrel tumbling operation. Actually, there is no "throwing" of the parts in the burnishing mass. In the process, the mass of granite chips actually flows freely over the surfaces of the parts being finished, the speed of barrel rotation being restrained so that the parts are not thrown out of the mass. The effect is a rubbing or honing action of the chips on the surfaces of the parts, rather than a hammering action.

While no great difference has been found in the mass action of the load of granite chips in a rotating barrel between a round barrel and an octagonal or hexagonal barrel, Plymouth processing engineers prefer the hexagonal barrel as the angle of roll of the stone is better and there is less tendency of the stone to slide around the periphery of the barrel rather than rolling in the mass.

A small quantity of stones in the barrel causes heavy parts to fall too hard in the processing operation, thus causing warping or pitting of work surfaces, breakage of stones and rapid destruction of barrel linings. It is important that the barrel compartment be filled with at least 50 percent and not more than 60 percent of granite chips.

How Heat-Treatment Affects High-Strength Irons

BY DR. C. R. AUSTIN, ASSISTANT TO THE PRESIDENT, MEEHANITE METAL CORPORATION

CAST IRONS respond to heat-treatment in a manner comparable to steel. The effects of heat-treatment are most marked in connection with the high-duty irons. As a result, designers and manufacturers of metal products have learned that a broad field of application exists for the heat-treated irons, and that their use promotes savings in cost, gains in production efficiency and increases in service life of products.

When casting the high-strength irons known as Meehanites, the foundry operates under process controls established by the Meehanite Research Institute. These controls are aimed toward achieving a definite nature and distribution of microconstituents in the cast metal. The response of the castings to heat-treatment has also been studied by the Institute, and these data can be used by the metal-products fabricator to impart the desired physical properties to the castings that he buys. Details of heat-treatments applicable to the engineering grades of these irons and photomicrographs of expected structures are given below:

1 Annealing for Stress Relief

Where a casting is complex in form, involving abrupt section changes, internal stress may result from varying cooling rates during solidification in the mold. This is true whether the casting is made of steel, bronze, cast iron or Meehanite. Annealing, which is heating to a specific temperature, followed by reasonably slow cooling, is more effective in removing casting stresses than the old method of aging or weathering.

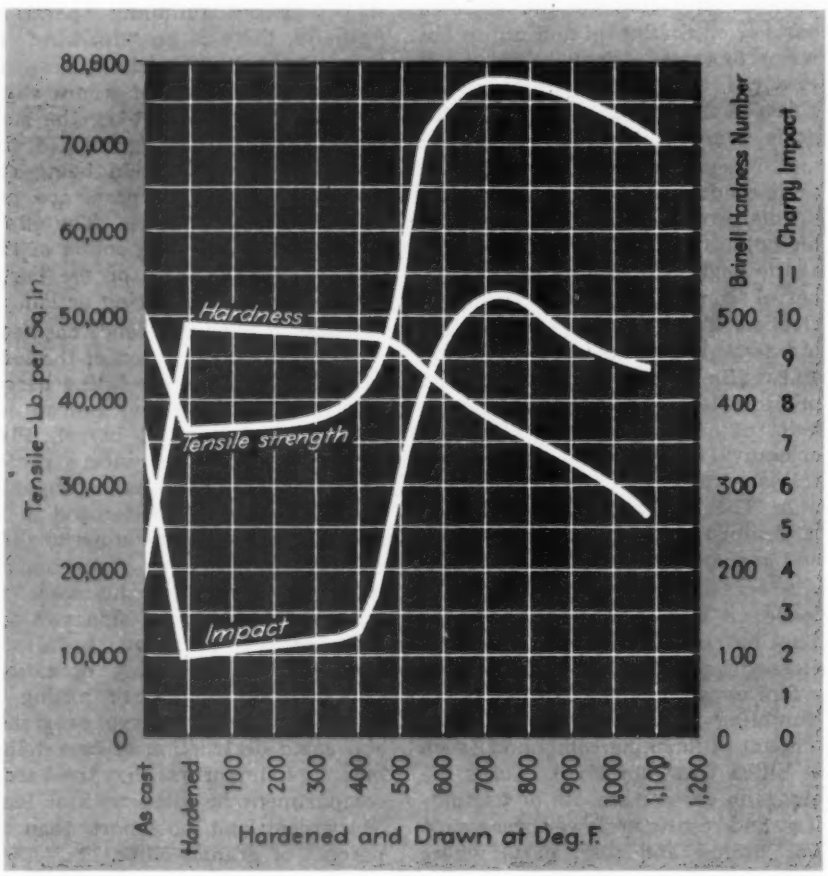
Temperature and time of the annealing treatment depend upon the type of Meehanite used, and the size and form of the casting. The high-strength types require a somewhat higher annealing temperature than do the medium-strength types.

Recommended Annealing Temperatures

Type	Temperature, F
GE-GD	950-1000
GC-GB	1050-1100
GA-GM	1100-1150

Heating time should be such that the casting is held at the specified temperature long enough for the heat to penetrate all sections uniformly. For complex castings the time factor may vary from two to five hours if all internal strain is to be removed. Castings should then be subjected to slow cooling.

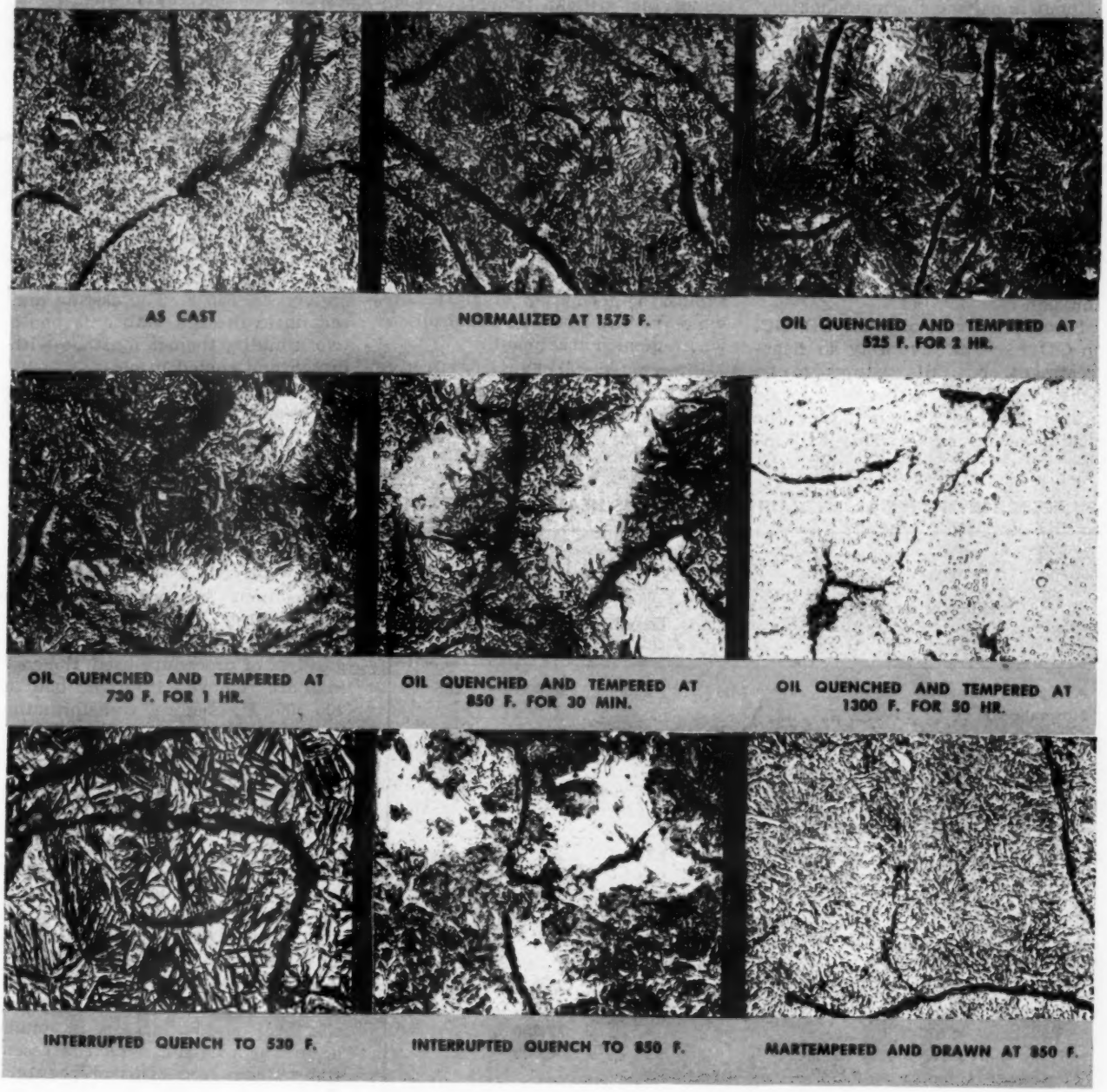
Effect of heat-treatment on the Brinell hardness, tensile strength and impact strength of type GA



2 Annealing for Improved Machinability

Two types of annealing are used to improve machinability; low-temperature and high-temperature anneals. In the low-temperature anneal the heat is held to just below the critical temperature; in the high-temperature anneal the heat is held to just above the critical temperature. Low-temperature annealing is somewhat common and improves machinability without materially affecting the hardness, but it may cause about 10 percent loss in strength. High-temperature annealing may cause loss of both strength and hardness if the annealing time is excessive. Annealing tempera-

STRUCTURES OF TYPE GA HIGH-DUTY IRON in as-cast and various heat-treated conditions are shown below. Pearlitic structures are evident for the as-cast and normalized irons. Upon oil quenching from 1575F., an essentially martensitic structure is generally assumed. After tempering for periods of 30 min. to 2 hr. at various temperatures, a varying amount of retained austenite (white areas) persists. Structures resulting from interrupted quench and martempering are also shown. All metallographic samples etched in nital; approximate magnification as published, 600 times


AS CAST
NORMALIZED AT 1575 F.
OIL QUENCHED AND TEMPERED AT 525 F. FOR 2 HR.
OIL QUENCHED AND TEMPERED AT 750 F. FOR 1 HR.
OIL QUENCHED AND TEMPERED AT 850 F. FOR 30 MIN.
OIL QUENCHED AND TEMPERED AT 1300 F. FOR 50 HR.
INTERRUPTED QUENCH TO 530 F.
INTERRUPTED QUENCH TO 850 F.
MARTEMPERED AND DRAWN AT 850 F.

tures vary according to the type of Meehanite as follows:

Type	Low Temp. Anneal, F.	High Temp. Anneal, F.
GE-GD	1220-1260	1550
GC-GB	1230-1270	1570
GA-GM	1250-1290	1580

Heating time should never exceed one hour per inch of casting section and should be followed by slow cooling. These castings should not require annealing for softening or machining purposes except in unusual cases, and then the foundry making the casting should be consulted.

3 Quenching for Hardness

The high-strength Meehanites, Types GM, GA, and GB, are comparable to carbon steel in their response to hardening by quenching in water or oil from above the critical change temperature. The effects of the conventional quench and tempering upon the tensile strength, impact strength and hardness of Type GA are shown in the accompanying graph.

When it is necessary to improve the machinability of hardened stock, tempering will produce the desired result. In those cases where the machinability must be improved with a minimum reduction in the Brinell hardness, a low-temperature exposure, at 400 F. or less, will re-

duce the hardness less than 4 percent of the ultimate. With the GM and GA types, tensile strengths above 75,000 lb. per sq. in. and Charpy impact values above 10 ft. lb. can be obtained by drawing at 730 to 750 F. for one to four hours.

To improve the abrasion resistance without impairing the machinability of the castings, direct oil quenching from a heat at 1575 to 1600 F. and drawing at 1050 to 1100 F. for one to two hours, will give Brinell hardness values of 290 to 321 which, although not the best hardness for machinability, is within the machinable range. Meehanite castings so treated have proved successful in applications requiring the combination of strength, ductility, machinability and increased resistance to abrasion.

Small parts cast of types GB, GC, or GD respond favorably to heat-treatment, but all castings to be heat-treated to achieve specific properties should be noted on the casting order issued. This will insure the preparation of stock suitable for treatment.

4 Interrupted Quenching

In the process of interrupted quenching, the casting is heated above the critical temperature to 1575 F. and held until it is uniformly heated. It is then rapidly transferred to a liquid salt or metal bath held at the predetermined interrupted quench temperature. The casting is maintained at this temperature for about 30 min., until the structure is completely transformed to what has been termed "bainite" or "intermediate product." The casting is then cooled in air. This treatment suppresses pearlite transformation but avoids the formation of martensite, which results from the usual oil- or water-quench treatment.

Interrupted quenching is effective only for castings of relatively small size, where it can be employed to increase markedly the tensile strength and hardness without loss of toughness. It also may be used where the conventional water or oil quench may result in cracking. If it is desired to increase toughness or resistance to shock, with a slight increase in tensile strength, the same method may be employed. In the first case the interrupted quench may be conducted at about 750 F., while for the last treatment 850 F. may be used.

5 Martempering

Martempering is a heat-treating process whereby martensite is formed with a minimum of hardening strains by quenching. The casting is heated to 1575 F. and quenched in a molten salt bath at approximately 400-500 F. The casting must remain in the salt bath only one or two minutes, then it must be withdrawn and cooled in air.

Another procedure, recommended for heavier castings, is to quench directly from the hardening temperature of 1575 F. in water covered with 1 in. of oil. The casting is then quickly withdrawn from the quenching bath when it reaches a temperature of about 500 F. and is immediately placed in a salt bath until all sections become equalized in temperature. Then, the casting is withdrawn and cooled in air. Regardless of procedure used, the castings are removed from the bath at 400-500 F., before transformation has occurred, so that cooling to room temperature results in the formation of a martensitic structure.

In principle, Martempering depends on the fact that rapid cooling to 500 F. results in marked contraction of the metal while the casting is still in the ductile austenitic state. Accordingly, the resulting strains are readily dissipated in the salt bath since the metal has not yet transformed to hard martensite. On subsequent air cooling, hard martensite forms and an increase in volume occurs in a casting which is essentially strain free. This procedure is particularly useful where an intricate casting has to be hardened and where cracking may be found to occur when using the conventional oil or water quench. After Martempering, a low-temperature draw may be used to minimize further any tendency to cracking. The tensile properties should be comparable to those obtained with the ordinary quench, but increased toughness may result.

The second installment will be published in an early number.

RESPONSE OF TYPE GA MEEHANITE TO VARIOUS HEAT-TREATMENTS

Condition or Treatment	Charpy Test Piece		Tension Test Piece	
	Impact Strength Ft. lb.	Brinell Hardness	Tensile Strength p.s.i.	Brinell Hardness
As Cast	14.5	255	58,800	255
Normalized:				
Air-cooled	14.7	285	57,400	269
Furnace-cooled	17.0	207		
Quenched in oil, 1575 F.	5.0	534		
Tempered:				
30 min cycle at:				
400 F.	7.	555		
530 F.	7.5	514		
730 F.	9.0	477		
850 F.	10.0	415	72,200	352
1000 F.	11.0	341		
1200 F.	12.5	285		
One hour at 730 F.			78,200	
Two hours at 525 F.			72,200	
Fifty hours at 1300 F.			40,600	
Martemper (1 min at 500 F.):	4.7	555		
Temper at 730 F., 30 min.	10.5	427		
Temper at 850 F., 30 min.	13.2	415	65,300	355
Temper at 1000 F., 30 min.	11.5	341		
Interrupted Quench:				
From 1575 F. to:				
530 F., held 30 min.	17.5	444	69,700	420
730 F., held 30 min.	16.0	302		
850 F., held 30 min.	12.7	281	78,000	363
1000 F., held 30 min.	14.5	321		

Note: Charpy tests made on specimens 15 mm. square with knife edges 70 mm apart. The figures tabulated above pertain to test specimens, and serve as a guide to the properties to be expected in the casting, dependent upon mass.

TALKING SHOP

Metal-Working Nativity

KOREA, free once again after 35 years of Jap misrule, was one of the birthplaces of the metal-working industry. Here's some of the evidence: Fifty years before Gutenberg suggested movable type in Europe, cast bronze letters were in regular use in printing plants all over Korea. Cast from patterns, they date back possibly to 1232 and certainly to 1392, when the first type foundry was built. . . Contrary to Jap propaganda, the Korean navy trounced the Jap navy soundly once—350 years ago. And contrary to our own propaganda, which dates the ironclad warship from the *Monitor* and the *Merrimac*, the Jap warships were overwhelmed by ironclad *ku-sun* or "tortoise boats" in 1595. These were wooden ships with a curved roof and exterior sheathed with iron and copper plates. Forged spikes on the turtle back repelled boarders. The hull was pierced with ports for long oars, and above that for cannon. The bow carried a hollow bronze dragonhead ram from which flaming arrows were fired. . . . About the same time a Korean invented what the Japs called "The Flying Thunderbolt." It was a cannon ball which came sailing into the courtyard of a Jap-held castle, shortly thereafter exploding to kill 30 of the Samuarai who had gathered to inspect it. The Japs never did succeed in copying either idea.

Too Careful Copying

SOME of our pet stories about the Japs were those told by Fred Colvin, Editor Emeritus of *American Machinist*, on his return from a visit to Japan some years ago. He found many machine tools there bearing U. S. nameplates. Closer inspection, however, showed that they were not brass or bronze, but were part of the base castings. . . . The Japs hadn't dared or bothered to remove them before using the originals as patterns. . . . Again he found that some minor police official always objected, or the people ran, when he attempted to photograph interesting scenes. So he equipped his Kodak with right-angle prisms on lens and finder and got some excellent shots. . . . Japanese home industry was flourishing then, of course. Bicycles, for example, were assembled from home-made parts. Each maker distinguished his product with a special sprocket design, punched progressively with a segmental die in a hand screw press.

Something Old, Something New

LIKE a bride's costume, this page apparently is destined to include "something old, something new, something borrowed and something blue." The borrowed material follows: "Tips for Top Shop Men" appeared originally as "Are You A Good Foreman?" in the Army-Navy aircraft production magazine, *Wings*. It occasioned so much favorable comment there that we are reprinting selected portions for other branches of the metal-working industry. E. J. Tangerman, who wrote the original series, has promised to add up-to-the-minute paragraphs.

OLD FRIENDS RETURN

LONG-TIME readers of American Machinist will recognize the titles of both this and page 136. They were once regular features. "Talking Shop" was suspended during the depression when editorial time and space were at a premium. "The Foreman's Round Table" was suspended early in the war. Both will again appear regularly, this page as the spirit moves, and the Round Table in every issue. Contributions to both are invited, and those published will, of course, be paid for. Your comments and suggestions will always be appreciated.

To Hold the Doughnut

UP IN VERMONT, C. R. Benton was struggling with a die to form "doughnuts" of half-round phosphor-bronze wire at intervals around flexible cable. The doughnut always loosened. He finally found the answer was to keep the cable straight and rigid during the operations of forming the U and closing it. Any deflection or bend during these operations caused loosening of the doughtnut when the cable was put under tension in service.

TIPS for Top Shop Men

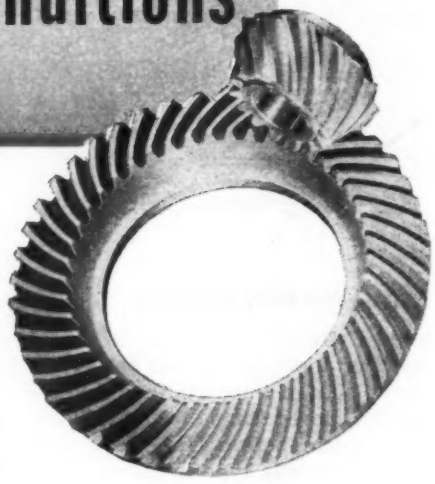
1 Be a good loser. Cherishing a grudge is permitted in little men—it's a mark of weakness in big ones. Americans work and play to win—we aren't nearly as "good sports" as we like to think. It is an effort to grin and take it when somebody shows you up or catches you in a blooper—particularly if the catcher works for you and it would be easy to get even. But if you can take it, you'll be a bigger man.

2 Do something about color and lighting in hazardous places. Much recent research has been done to determine what colors are suitable as warning symbols, illumination aids, fatigue reducers, lubrication guides, etc. With modern lighting, they build efficiency.

3 Don't trust personally owned "pet" tools. Some of the favorite tools of workmen are like favorite children—a little spoiled. If you permit employees to use their own tools, arrange to have them checked for safety and accuracy.

4 Preventive maintenance is good, but prevention of maintenance is better. If some machine part must be fixed up frequently, it may be preferable to substitute another material or shape that avoids the cause of wear or other difficulty. If a bearing must be lubricated overoften, it may be better to change the type of bearing.

Special Analysis of Gear Mesh Clarifies Curvature Conditions



BY ERNEST WILDHABER, GLEASON WORKS

Duplex generation method gains in popularity and corrects bias bearing of gear teeth. Necessity of special gear blanks is shown in this concluding installment

A COMPLETE picture of the curvature conditions throughout the mesh of bevel gears can be obtained readily and profitably. This analysis will cover special cases of bevel gears, especially of spiral bevel gears wherein the individual curvature radii at all points of the line of contact are immediately apparent.

These curvature radii refer to plane sections perpendicular to the line of contact *I*. The normals, at all points of instantaneous contact, constitute a surface which contains the instantaneous axis. Sometimes this surface of the contact normals is a plane. It is always a plane when the tooth surface of one gear is a plane—and also when the tooth surface of a basic gear is a plane. The basic gear itself may be either a crown gear or a tapered gear.

The surface of the contact normals is also a plane when any of the said tooth surfaces is a spherical surface. In this case it is the plane which contains the instantaneous axis and passes through the sphere center. This plane of the contact normals intersects the sphere in a great circle. It ordinarily changes its inclination to the pitch plane during mesh through a tooth cycle, while continuously passing through the instantaneous axis along its whole length. The various positions of this plane envelop a conical surface portion on each of the two turning gears. It is somewhat in the nature of a base cone, but ordinarily is neither circular nor concentric with the gears. At any instant of the tooth cycle, the plane of the contact normals contacts each conical surface portion along a straight line element, which passes through the intersection point of the axes *O*. This straight line element can be considered as the intersection of infinitely close positions of the plane of the normals, with respect to the pinion or gear, and as such constitutes an axis of curvature of the tooth surface of the pinion or gear. In the region close to and extending along the line of contact *I*, the tooth surface can be considered a surface of revolution whose axis is this straight line element.

The sphere center *S* lies in the plane of the normals, Fig. 16, and $\rho_s = SP$ is the sphere radius. The line of instantaneous contact *I* is inclined at an angle ψ_b to the instantaneous axis *OP*, formula (6).

The curvature $\frac{1}{\rho_{wp}}$ of the pinion, in a direction perpendicular to the line of contact, depends on the nature of the basic gear, that is on its relative curvature $\frac{1}{\rho_{pr}}$ of the normal profiles with respect to the pinion. $\frac{1}{\rho_{pr}}$ can be computed with formula (8), by substituting the pitch angle of the basic gear for Γ. The relative curvature $\frac{1}{\rho_{gr}}$ of the basic gear with respect to the gear member can be similarly computed.

A relative curvature $\frac{1}{\rho_{pr}}$ of the normal profiles corresponds to a relative curvature of $\frac{1}{\rho_{pr}\cos^2 w}$ in a section perpendicular to the line of contact. Hence

$$\frac{1}{\rho_{wp}} = \frac{1}{\rho_{pr}\cos^2 w} - \frac{1}{\rho_s}$$

on the side which is concave lengthwise. Herein ρ_s denotes the sphere radius, and $\frac{1}{\rho_s}$ is the curvature of the convex spherical tooth side of the basic gear.

Point *E'* is obtained by plotting curvature radius ρ_{wp} on normal *SP*. Line *OE'*, the axis of tooth curvature of the pinion, can now be drawn. The curvature $\frac{1}{\rho_{wg}}$ of mating gear tooth surfaces can be computed as

$$\frac{1}{\rho_{wg}} = \frac{1}{\rho_{gr}\cos^2 w} + \frac{1}{\rho_s}$$

The curvature center *E"* is obtained by plotting curvature radius ρ_{wg} to the opposite side on normal *SP*. *OE"* is the curvature axis of the mating tooth side of the gear. The sign of $\frac{1}{\rho_s}$ is reversed when the longitudinally convex side of the pinion teeth and the mating side of the gear teeth are considered.

On formate gears with spherical tooth surfaces:

$$\frac{1}{\rho_{wg}} = \frac{1}{\rho_s}; \quad \frac{1}{\rho_{wp}} = \frac{1}{\rho_w} - \frac{1}{\rho_s}$$

; for ρ_w see (9)

After determining the curvature axes *OE'* and *OE"* for any given position of mesh, the curvature at any point *U* of the instantaneous line of contact may be readily determined by drawing normal *US*. It intersects the curvature axes at points *V'* and *V"*, so that *UV'* and *UV"* are the curvature radii. At any point *U* the teeth contact like two cylindrical surfaces whose radii are *UV'* and *UV"*. The procedure can be repeated for other positions of contact, which correspond to point *P* differently positioned on the instantaneous axis. In this way a complete picture of the curvature conditions throughout the mesh is obtainable.

Line *I* intersects the curvature axes *OE'* and *OE"* in points which should be outside of the reach of mating teeth, at any position of mesh.

Bias Bearing

Ordinarily bevel gear teeth are tapered in depth and their depth increases with increasing distance from the cone center *O*. This also applies to the tooth sides of the pair of basic gears. These tooth sides are usually conical surfaces, represented by straight cutting edges of rotating face-mill type cutters.

When the teeth are tapered in depth, the conical tooth surfaces of the pair of basic crown gears or other basic gears cannot be made to match exactly. The straight line elements of the conical surfaces of the pair are then inclined to each other. In other words, the pair of basic gears are not exactly complementary.

Bias bearing of the teeth would result if no correction were provided. The tooth surface portion swept by the mesh would then extend in a diagonal zone across the tooth surface. This can be avoided by a slightly altered generation. Another way to avoid it would be to substitute spherical cutters for the conical cutters ordinarily used. Spheres can be made to match, regardless of whether the tooth depth is tapered or constant, and the pair of basic gears can then be used without alteration.

In duplex generation, which has been applied to small gears for nearly 25 years, both sides of a tooth space are simultaneously cut with a single cutter on both gears of a pair. To generate a gear pair by the duplex method it is necessary that the gear blanks be adapted for this process.

Fig. 17 is a section through the pitch plane of a basic crown gear, showing teeth *T*, one of which will be described by the rotating cutter. The shown pitch lines of opposite tooth sides, L_1 and L_2, are so inclined to each other that their spiral angle is the same on both sides of the teeth. Thus the inclination of pitch line L_1 to radius OP_1 is the same as the inclination of pitch line L_2 to radius OP_2, and equal to the spiral angle ψ. In the instance illustrated, PP_1 and PP_2 are each a quarter of the circular pitch at radius $A = OP$, that is

$$PP_1 = PP_2 = \frac{\pi A}{2N_e}$$

$$\pi = 3.1416;\ N_e = \frac{N'}{\sin \gamma} = \frac{N''}{\sin \Gamma}$$

N_e is the number of teeth per full circumference of the crown gear.

If the cutter axis were perpendicular to the drawing plane of Fig. 17, which is the pitch plane of the crown

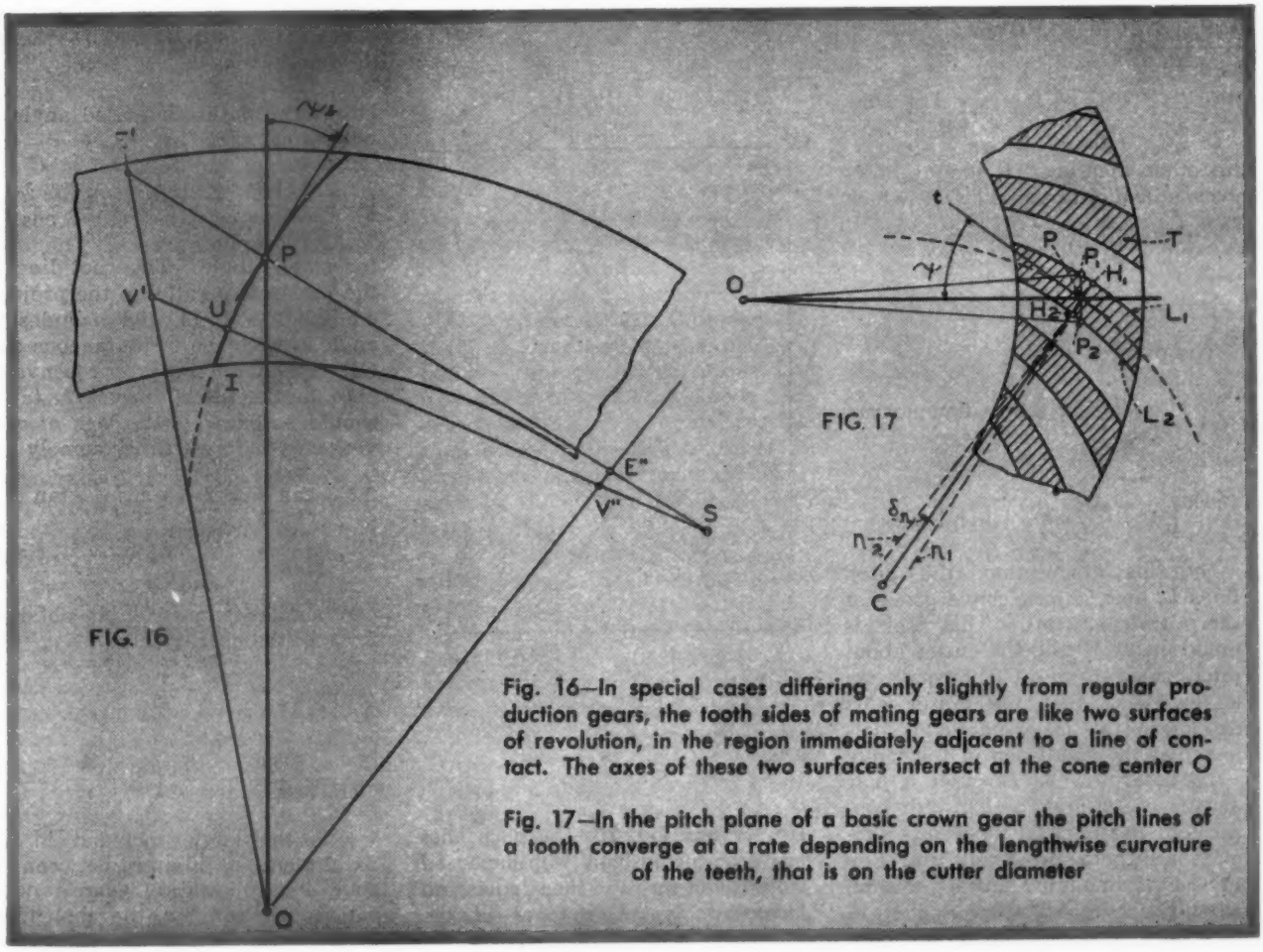


Fig. 16—In special cases differing only slightly from regular production gears, the tooth sides of mating gears are like two surfaces of revolution, in the region immediately adjacent to a line of contact. The axes of these two surfaces intersect at the cone center O

Fig. 17—In the pitch plane of a basic crown gear the pitch lines of a tooth converge at a rate depending on the lengthwise curvature of the teeth, that is on the cutter diameter

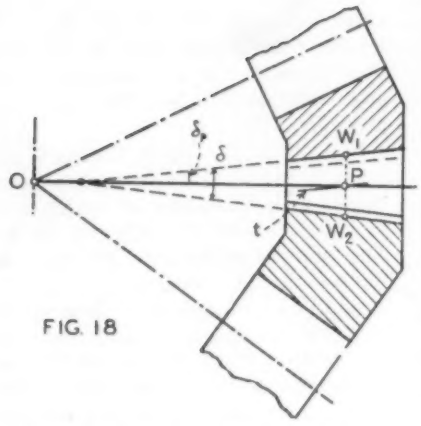


FIG. 18

Fig. 18—For duplex generation, the convergence of the pitch lines shown in Fig. 17 calls for a corresponding depthwise taper of the teeth

gear, then the pitch lines L_1 and L_2 would both be perpendicular to pitch line normal PC. The same is true when the cutter axis is contained anywhere in the normal plane PC. The pitch line tangents at points P_1 and P_2 would then be inclined to each other at an agle defined by the sum of the arcs HP_1 and H_2P_2, which have a radius $r = CP$. The inclination angle therefore would be

$$\frac{H_1P_1 + H_2P_2}{r} = \frac{P_1P_2 \cdot \sin\psi}{r}$$

$$= \frac{\pi A}{N_c} \cdot \frac{\sin\psi}{r}$$

in radian measure. It should, however, be equal to angle P_1OP_2, which is

$$\frac{P_1P_2}{A} = \frac{\pi}{N_c}$$

The difference is

$$\frac{\pi}{N_c}\left(1 - \frac{A}{r} \cdot \sin\psi\right)$$ in radian measure;

and

$$\frac{10800}{N_c}\left(1 - \frac{A}{r} \cdot \sin\psi\right)$$, in minutes.

By this assumption, the pitch lines L_1 and L_2 lack convergence of the above amount. This lack is made up by tilting the cutter about pitch line normal CP through an angle δ_n, so that the cutter cuts deeper at the large end and shallower at the small end of the teeth.

To determine δ_n, consider a pair of surface normals which both pass through mean point P. These normals are both projected into line PC in the imagined initial position, when the cutter axis is contained in the normal plane PC. They are both inclined to the pitch plane at the pressure angle ϕ. One of these surface normals PC extends down below the pitch plane, and the other upward.

When tilted about line CP of the pitch plane, through an angle δ_n in the direction shown in Fig. 17, the inclination ϕ of the normals to the pitch plane is practically unaffected, but their directions are changed. The normal which extends downwardly from point P is then projected as a line n_1, and the other normal as a line n_2. The angle included between these projections can be computed as

$$2\,\delta_n \cdot \tan\phi$$

for moderate angles δ_n.

The line of intersection of a side surface with a plane is always perpendicular to the projected surface normal. It is seen then that the direction of the pitch lines has been altered by the same amount as the direction of the projected normals.

After tilting the cutter through angle δ_n, its peripheral direction at P is inclined at the angle δ_n to the pitch plane. This angle appears increased in a view perpendicular to the axial plane in Fig. 18. The relationship of the increased angle δ_p, with angle δ_n is

$$\tan\delta_p = \frac{\tan\delta_n}{\cos\psi}\text{ ; or also }\delta_p = \frac{\delta_n}{\cos\psi}$$

for small angles. The root line of the pinion is parallel to the projected line t, Fig. 18, and includes an angle δ_p with the instantaneous axis OP. To obtain the proper convergence of the pitch lines, $2\,\delta_n \tan\phi$ should be equal to the lack of convergence before tilting, namely

$$2\,\delta_n \cdot \tan\phi = 2\,\delta_p \cdot \cos\psi \cdot \tan\phi = \frac{10800}{N_c}\left(1 - \frac{A}{r} \cdot \sin\psi\right)$$

A similar expression is obtained for δ_g of the gear. Hence:

$$(10)\ \delta = (\delta_p + \delta_g) =$$

$$\frac{10800}{N_c \cdot \cos\psi \cdot \tan\phi}\left(1 - \frac{A}{r} \cdot \sin\psi\right)$$

δ is the angle included in the axial plane, in minutes, between the root lines of mating gears, and is called the sum of the dedendum angles. To obtain the root lines,

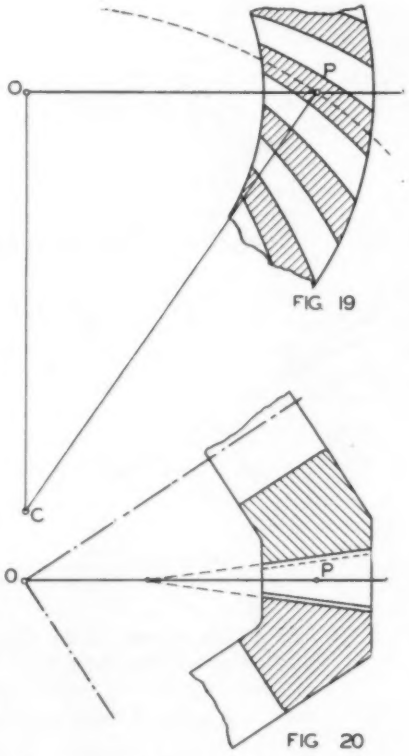


FIG. 19 FIG. 20

Fig. 19 and Fig. 20—The pitch lines converge increasingly with increased cutter diameter, and then require an increased depthwise taper of the teeth for duplex generation

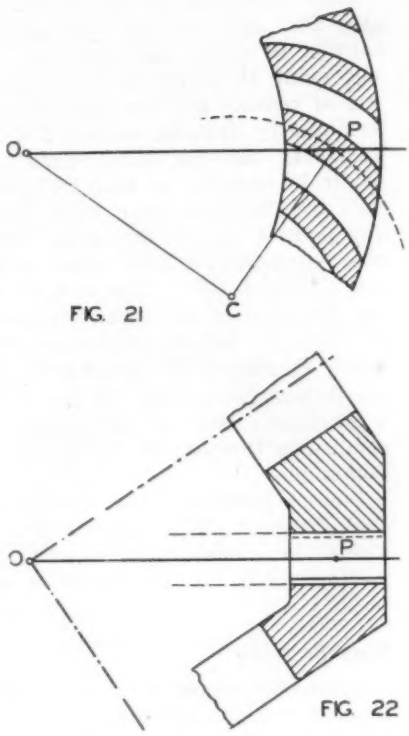


FIG. 21 FIG. 22

Fig. 21 and Fig. 22—No depthwise taper of the teeth is required for duplex generation, when the teeth are as much curved lengthwise as shown. This limit case applies primarily to gears with small shaft angles

suitable dedenda PW_1, PW_2 are plotted from mean point *P*, Fig. 18, and the root lines are then drawn to include angle δ between them. The face lines of the mating gears are made parallel to the root lines, and have a constant clearance from them.

Formula (10) is applicable regardless of whether the addenda are equal or unequal on mating gears. It can be used on formate as well as on generated gears. In all cases it is well suited for determining the face angles of the gear blanks.

Figs. 17 and 18 illustrate a case where the root lines intersect at a point close to cone center *O*, and where the gear blanks depart very little from conventional blanks not tied up with the cutting process. Figs. 19 and 20 show the conditions existing when a cutter of larger diameter is used to cut the same gear pair. Here the teeth are more tapered depthwise and the root lines intersect at a point further away from cone center *O*. Most of the actual duplex-cut spiral bevel gears are between or near these two cases.

A limit case is illustrated in Figs. 21 and 22 and here the cutter diameter is much smaller than cone distance *A*. The cutter center *C* is at the projection of the cone center *O* to the mean pitch line normal *PC*. This results in teeth of constant depth, without taper. The teeth are so sharply curved that the tooth thickness is substantially the same at outside and inside ends of teeth.

It is understood that what goes for cutting also applies to grinding, as both processes are fundamentally the same.

Ease-off Obtained

While tooth surfaces can be made which match each other completely, so that the tooth contact sweeps the entire working surface, these would be very sensitive to the slightest inaccuracies and to deflections in the mounting. Much better results are obtained when the tooth sides are eased off at both the profile and tooth ends. When the gears are rigidly mounted and run on their exact centers with a light load, the tooth contact then sweeps only a central area. This area is displaced when the exact mounting position is disturbed. Sufficient ease-off is provided to keep the heaviest loads safely off the tooth ends under actual operating conditions.

Ease-off can be applied by suitable generation, or it can be built into the cutter shape. Spiral bevel gears are the gears with the original ease-off. Ease-off came naturally with the face mill type cutter, which readily cuts a larger radius with the outside blades than with the inside blades, so that the concave side of the gear teeth is a little flatter than the mating longitudinally convex sides.

De-Air Hydraulic System

BY JOHN E. HYLER

THE wide application of hydraulic systems to machinery of different kinds has made it more or less imperative for the shop mechanic to have some knowledge of their working, some idea of what may cause trouble, and know what steps can be taken to eliminate difficulties. One interesting thing that many do not know is that shock absorbers are available for use in connection with hydraulic systems.

Air trapped in a hydraulic circuit will cause trouble. Therefore, it is necessary to keep the system free from air at all times, because air is compressible while fluid is not. Consequently, the presence of air causes fluctuations in performance. Where a machine table is being traversed hydraulically, air in the hydraulic circuit may cause the table to shudder in its advance, or, in some instances, even to stall.

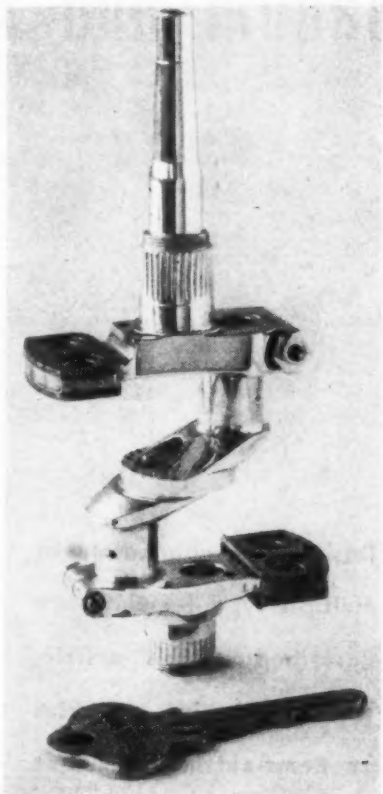
Air may enter a hydraulic system if the hydraulic pump suction is not well submerged in the oil, or other fluid used. Another way air enters is when the equipment stands idle for any appreciable length of time. The gravitational pull of the oil or other fluid in the lines is downward, and tends to pull air in at the top, if there is any point where it can enter in even the smallest degree. It is proper practice, therefore, to provide an air bleed at the highest point in the circuit, and to practice bleeding the system of air, before putting the equipment into operation after it has stood idle for any length of time. Special air release valves, designed especially for bleeding air from hydraulic systems, may be obtained from some makers.

Precision to Scale

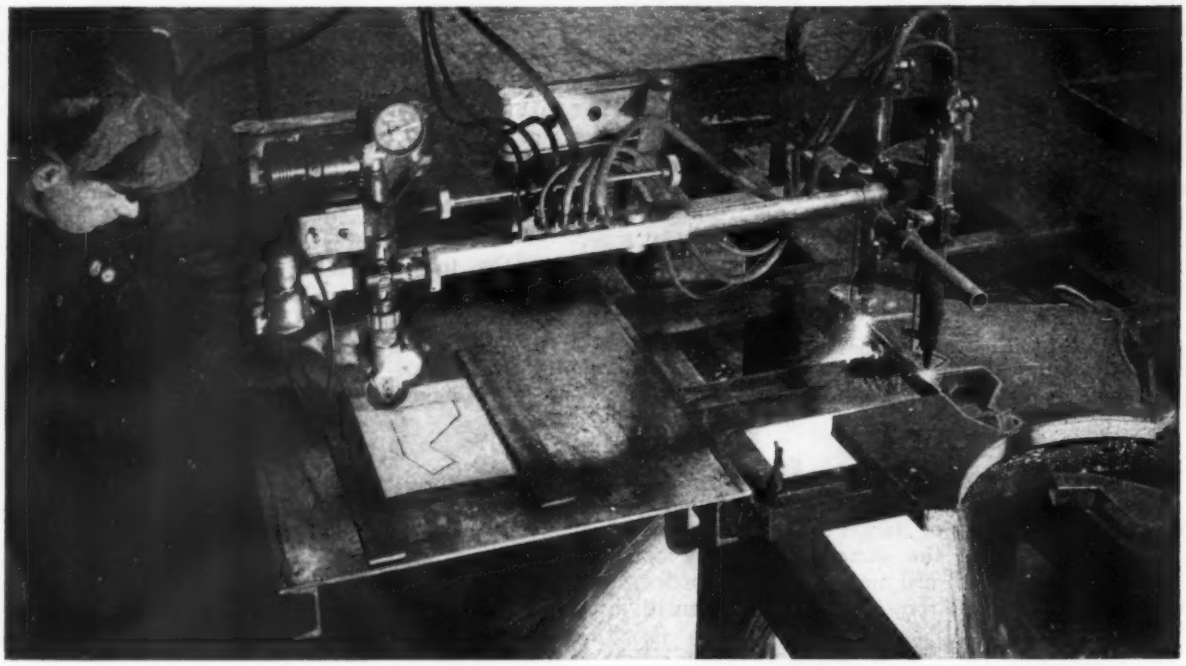
SPENDING 400 hours of his leisure time, Al Vitt, tool designer in the aviation division of the Ohio Crankshaft Company, fashioned a scale model weighing only 4½ ounces of a two-throw aviation engine crankshaft weighing 179 pounds.

Approximately 512 times smaller than its counterpart, the model is highly accurate, critical dimensions being held to 0.0005 in. The dimensions are closer in some respects than a few of the fine limits of the airplane crankshaft on which there are 145 dimensions having a total tolerance of 0.001 in.

Vitt used machine steel and a metal lathe in his basement workshop. The front and rear splines were cut with a ½-in. diameter dental grinding wheel rigged to a hand grinder and held in a special swinging fixture. Oil holes were drilled on a drill press with needle drills, the smallest being 1/64 in. The model has 17 pieces and can be dismantled into three main parts. It is buffed, polished and chrome plated with brass counterweight plates press-fitted onto the flat counterweight extensions.



Model: 4¼ oz.; original 179 lb.



The manual tracing device is guided by hand along pencil or ink templet outlines on paper. It is self-propelling, but any changes in direction are made by manually turning the tracing wheel mount. It will move on a straight line without guidance. It is best suited to small-quantity reproduction, or where the expense of making steel templets is unwarranted

Manual and Automatic Tracers Require Accurate Templets

Design and application of multiple-type templets are described in this article, the eighth in a series on flame-cutting technique

BY DR. G. V. SLOTTMAN, APPLIED ENGINEERING DEPARTMENT, AIR REDUCTION SALES COMPANY

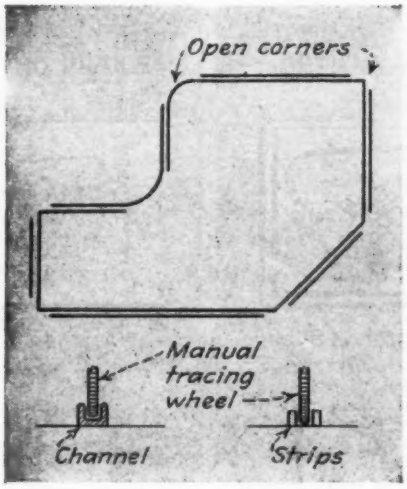
TORCHES on universal shape-cutting machines can be guided by any one of four types of tracing devices, using a templet appropriate to the method of tracing. The choice between manual, spindle, magnetic, or photoelectric tracers depends upon the number of pieces required, the accuracy needed and, to some degree, preference. In each case the templet or cam is geometrically similar to the shape of the piece to be cut, with allowances for kerf width, finish, and thickness or diameter of the tracing wheel.

The manual tracing device is designed to obviate the need of making an elaborate templet, which would not be justified when only a few pieces are to be cut. An outline drawn in pencil or ink on durable paper or cardboard is usually employed as a templet for the manual tracer. This device consists of a knurled wheel driven by a variable-speed motor, resting under pressure on the templet. The operator merely guides the direction of this wheel over the contour of the drawing fastened to the tracing table. Since the human element enters into this operation, a degree of inaccuracy may prevail. Other disadvantages of paper templets are that they are short-lived and are susceptible to expansion and contraction with

changes in atmospheric conditions. The effect of the latter can be quite considerable in the case of large templets.

To avoid these disadvantages, other types of templets are sometimes used. At one plant where manual tracers are extensively used, templet outlines are machined in the form of shallow U-grooves in masonite boards. These are inexpensive, durable and accurate. Another method is to mount a guiding channel for the tracing wheel on a base board.

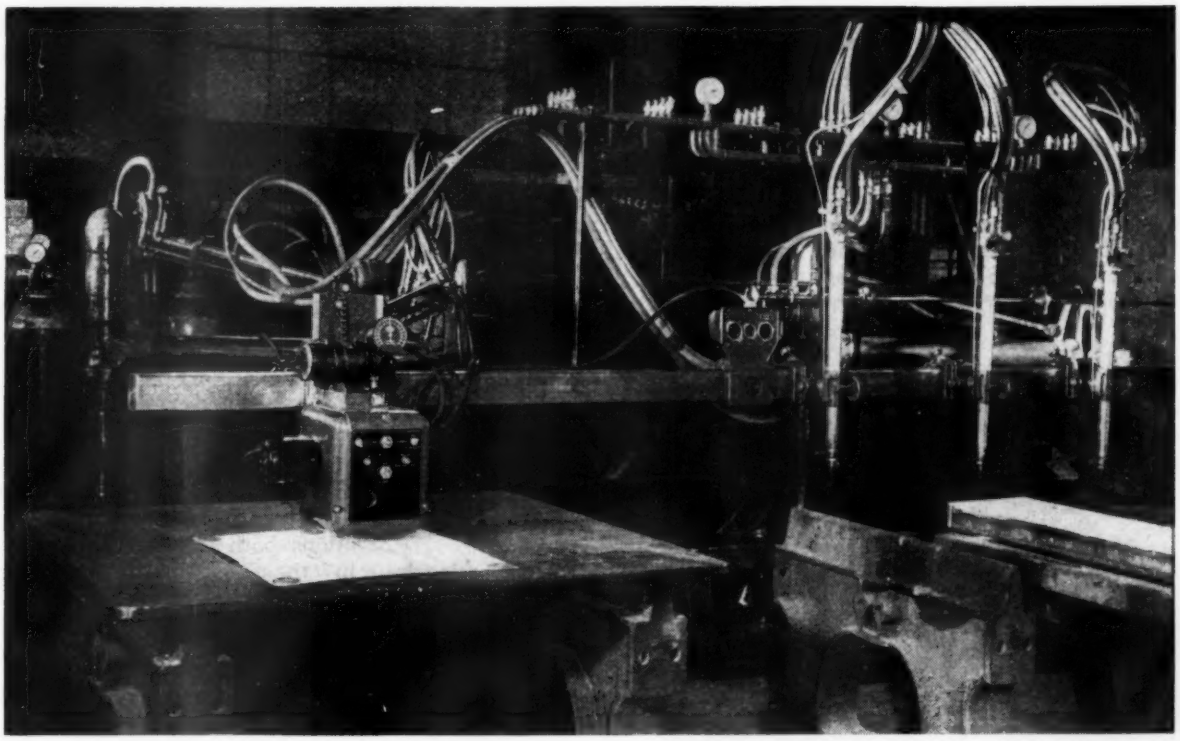
Cold-rolled steel or aluminum, formed to the required contours, is mounted as shown in an accompanying illustration. Small channels or double strips can be used, with the tracing wheel riding snugly between. At corners or curves the outside strip must be removed to permit the comparatively large diameter wheel to negotiate the change in direction. The wheel is guided by hand against the inside strip at these points. On straight runs the wheel is confined between walls and is self-guiding. This type of templet is accurate, easily constructed, and is readily adjustable for correction of distortion in cutting.



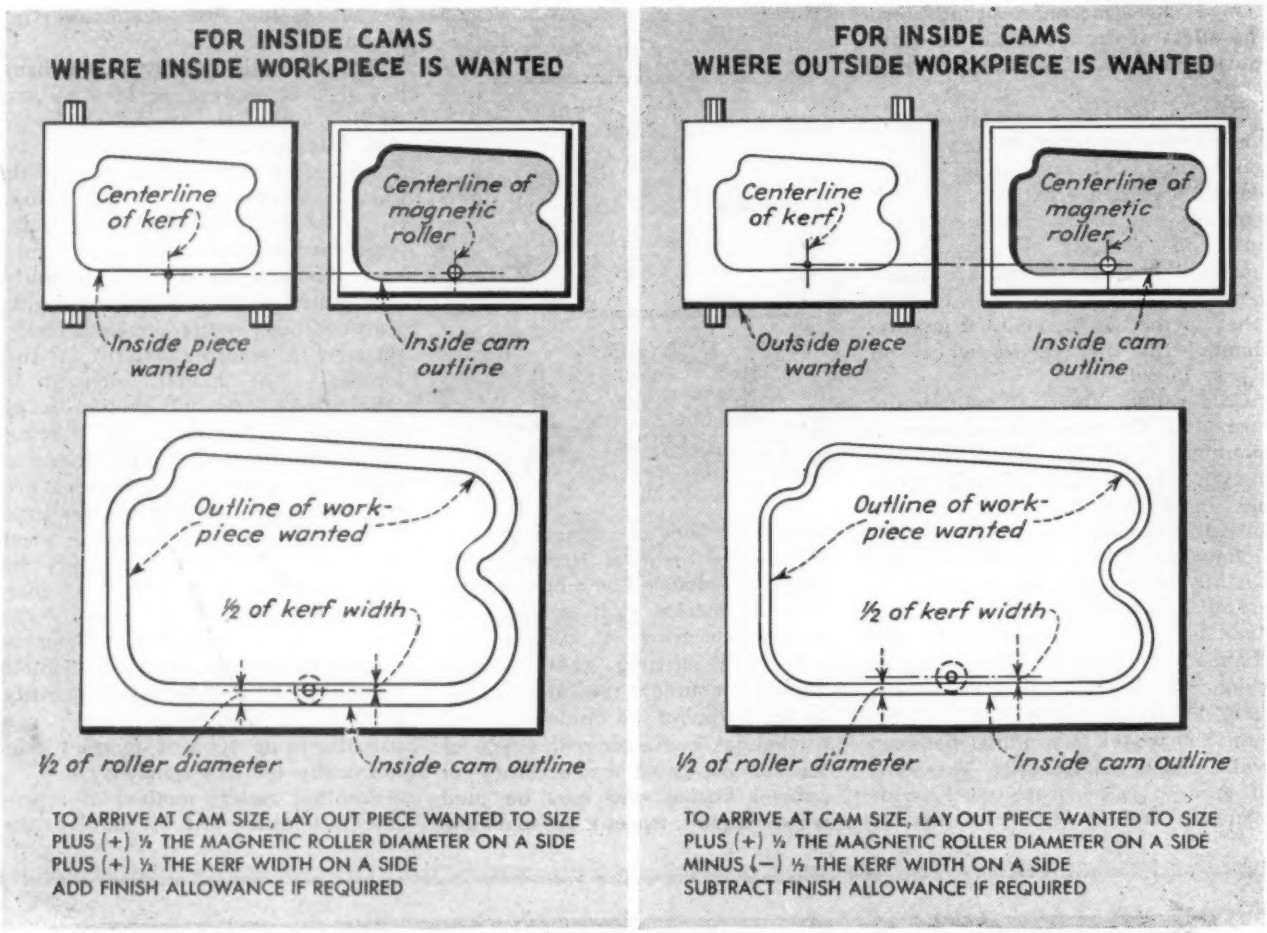
Showing layout of channel or strip guides for manual tracing. The guides are mounted on a base board, with the outside strip or flange of channel cut away at corners and radii. The tracing wheel is self-guiding on straight runs, and is held by hand against the inside strip wall at changes in direction. This type of templet improved the accuracy of manual tracing and may be used when magnetic tracer is not available

An electronic tracing mechanism has been developed recently for accurate, automatic tracing from a paper templet, which may be in the form of a heavy pencil or ink line, or a white paper cut-out like a "paper doll" mounted on a dark paper background. This device follows the edge of the templet outline with a tiny beam of light, transmitting motion automatically through a steering motor to the torches. The human element is eliminated, and reproduction is as accurate as by magnetic tracing with steel templets. The principal advantage is that paper templets are less expensive and require less time than construction of accurate steel templets. The drawings may be sprayed with clear lacquer to prevent soiling, and can be easily replaced when damaged. Whereas manual tracing from paper templets should be limited to small-quantity production, electronic tracing can use the same type of templet economically for any quantity.

Another recent method of reproducing templet outlines involves the

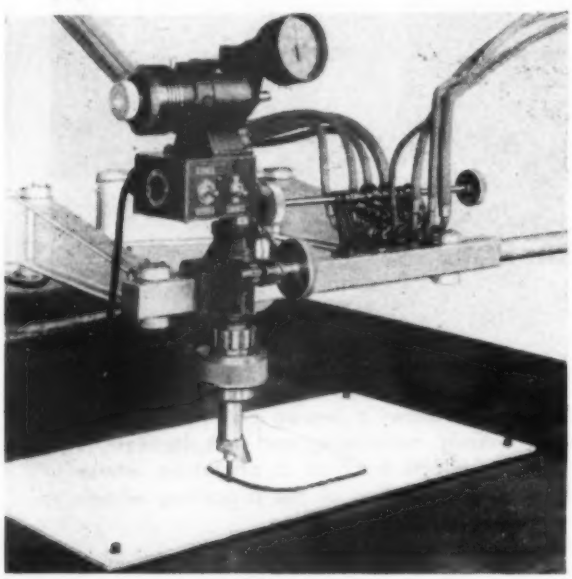


The latest development in tracing devices, this photo-electric tracer follows a line on paper with a degree of accuracy equal to magnetic tracing. The operation is entirely automatic, and templet cost is negligible. A small beam of light cast upon the templet outline reflects back to a phototube whose energy is transmitted to a steering motor, which in turn changes the direction of the propelling wheel. The latter rests on the templet but does not ride on the line tracing


FOR INSIDE CAMS
WHERE INSIDE WORKPIECE IS WANTED
Centerline of kerf
Centerline of magnetic roller
Inside piece wanted
Inside cam outline
Outline of work-piece wanted
½ of kerf width
½ of roller diameter
Inside cam outline
TO ARRIVE AT CAM SIZE, LAY OUT PIECE WANTED TO SIZE
PLUS (+) ½ THE MAGNETIC ROLLER DIAMETER ON A SIDE
PLUS (+) ½ THE KERF WIDTH ON A SIDE
ADD FINISH ALLOWANCE IF REQUIRED
FOR INSIDE CAMS
WHERE OUTSIDE WORKPIECE IS WANTED
Centerline of kerf
Centerline of magnetic roller
Outside piece wanted
Inside cam outline
Outline of work-piece wanted
½ of kerf width
½ of roller diameter
Inside cam outline
TO ARRIVE AT CAM SIZE, LAY OUT PIECE WANTED TO SIZE
PLUS (+) ½ THE MAGNETIC ROLLER DIAMETER ON A SIDE
MINUS (−) ½ THE KERF WIDTH ON A SIDE
SUBTRACT FINISH ALLOWANCE IF REQUIRED

Method of schematic cam layout for calculating the size of steel templet for magnetic tracing

spindle type of tracing device. This is a motorized knurled rod which is held by the operator against the edge contour of a wooden templet. Reproduction is generally more accurate than by manual tracing, and and the templet more durable, being made usually of plywood or masonite mounted on a base board. This method is best suited to the cutting of intermediate quantities of identical parts. Because it lacks the advantage of automatic operation characteristic of magnetic tracing, yet requires a more elaborate templet than the manual method, it is much less widely used than either of the other methods.



The spindle tracing device shown consists of a motorized, knurled spindle which the operator merely holds against the edge of a wooden or composition templet. It requires constant attention but is generally more accurate than manual tracing, and the templet is inexpensive

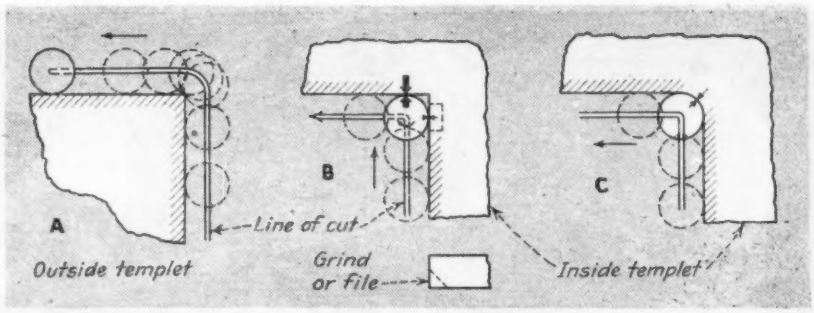
The magnetic tracing device, operated in conjunction with steel templets or cams, is the most popular method of tracing. This device consists of an electrically magnetized, knurled roller, driven by a variable-speed motor. In contact with the edge of a steel templet, it rolls its way around the edge contour, guiding the torches along the same path. The templets are made of 5/16 or ⅜-in. steel plate, and may be one piece or composite. They lend themselves to numerous variations both in their designing and in the mass-production schemes which can be built around them. Before describing some of these applications, a general discussion of cam design is appropriate.

Cams are classified as either inside templets or outside templets, according to whether the tracing roller runs on an inner or an outer surface. Each type may be designed for cutting either an inside or an outside workpiece. Thus there are four classifications of templet, each requiring different allowances for

width of kerf and diameter of tracing roller. The contour of inside templets is always larger than the finished workpiece, while outside templets are smaller. In both cases the allowance is equal to the radius of the roller, plus or minus half the kerf width and finish allowance, if any. Formulas for the design of each of the four types of templet are given.

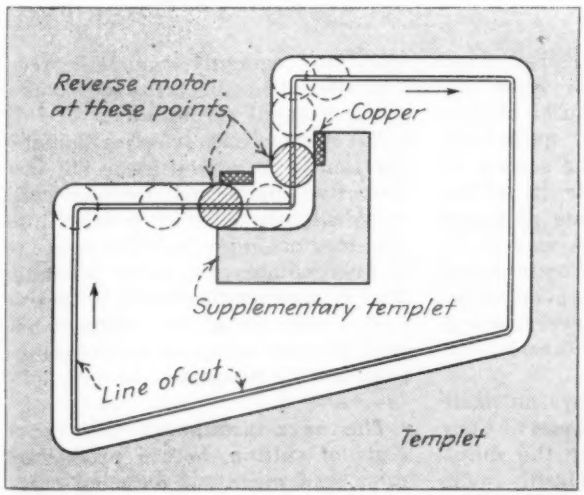
Whether to use an outside or an inside cam for a given cutting job is a problem which can only be determined by analysis of the shape to be cut. There are occasions, as in cutting narrow tongues, where an outside templet cannot be used because the sum of the cam allowances at such points would be a minus dimension. Additionally, it should be observed that inside cams must be used wherever square corners must be cut, because the shape of a cut obtained when the tracing roller moves around a square outside corner is a radius cut.

Inside corners on inside cams must be prepared in either of two ways to prevent the magnetized roller from moving into a corner and remaining there because of magnetic attraction of equal power at two points. One method is to cut the inside corners to a radius about 1/32 in. larger than the radius of the roller, thereby giving single-point contact to the roller as it negotiates the corner. The cut in this case will have a slight radius, acceptable for some classes of work. The other method involves grinding or filing a bevel on the lower edge of the templet at one of the roller contact points. This reduces the effective magnetic attraction at this point, permitting the stronger magnetic pull at the other point to hold sway so that the roller will continue its progress. This method cuts a sharp corner on the inside workpiece, leaving a small radius on the outside piece.



(A) When designing templets it must be remembered that a sharp corner cannot be cut when the tracing roller rounds an outside corner. Instead of being square, the corner as cut will have a radius approximately equal to that of the roller. Inside templets must be used to secure square cut corners. (B) Showing how to prepare an inside corner on a templet. Without the bevel, shown in dotted lines, the magnetized roller would stick in the corner. With the bevel, magnetic attraction is light (thin arrows) due to reduction in contact area. Strong attraction at the other side (heavy arrows) overcomes this restraining pull, and the roller advances, leaving a sharp-cornered cut. (C) Another method of preventing stoppage at inside corners is to give them a radius slightly larger than that of the roller. The cut has a slight radius which is not objectionable for many purposes

There may be occasions when a sharp re-entrant corner appears in an inside cam, making in effect an outside cam at this point. To cut a sharp angle here it is necessary to make a supplementary cam for this corner. During cutting, the rotation of the tracing roller is reversed at the points of entry and exit from this supplementary cam. Spacing between the two templet sections must be accurate to insure smooth transition without jumping of the magnetized roller from one section to the other. If desired, copper insert strips can be used at the junctures to control the direction of magnetic attraction. Beveling of the underside as previously described will accomplish the same purpose.



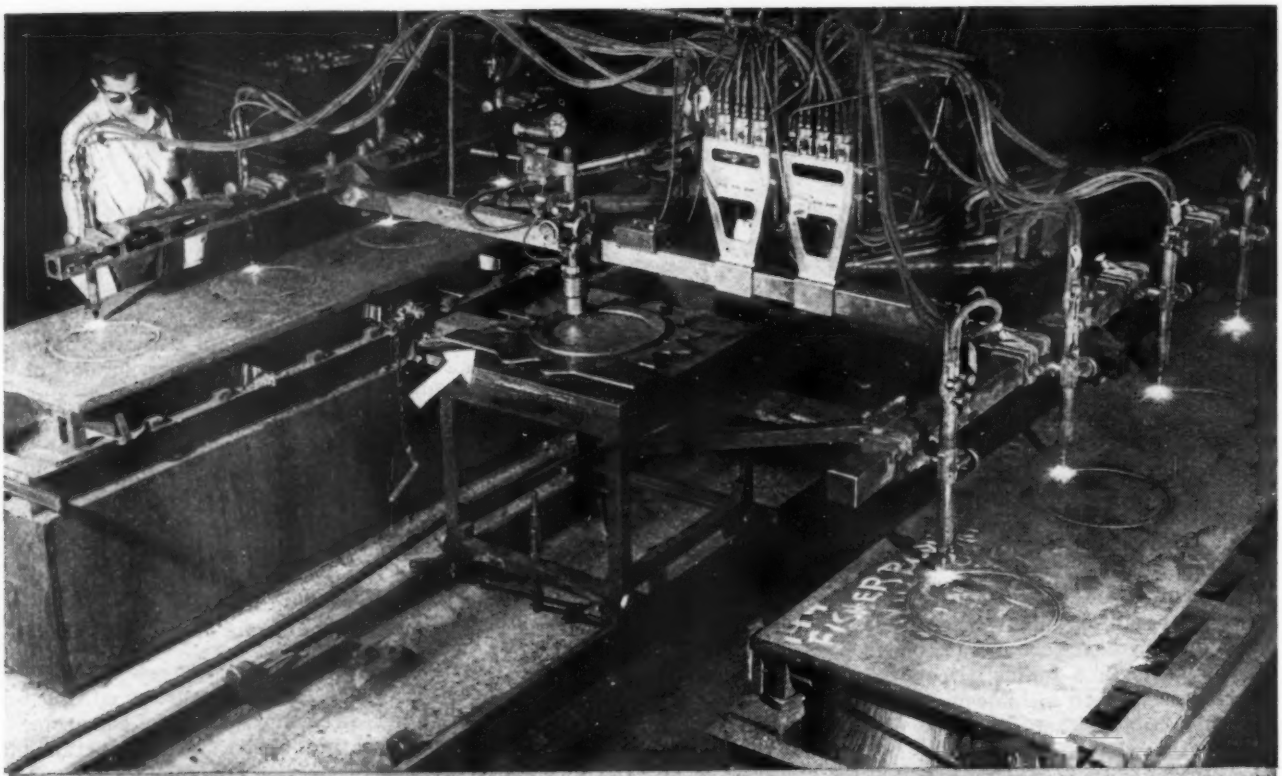
This illustrates the method of designing a templet to cut a sharp re-entrant corner. The supplementary templet at center guides the roller around this corner. Shaded circles indicate positions of tracing roller at points where its rotation must be reversed to continue forward travel. Copper inserts serve to control the direction of the magnetic attraction

When highly accurate cutting is not necessary, savings can sometimes be effected in construction of large cams for magnetic tracing by making them of wood, faced with steel strip. In the construction of small or involved templets, however, it is usually cheaper and faster to flame-cut the templet from steel plate, filing the edges smooth where necessary.

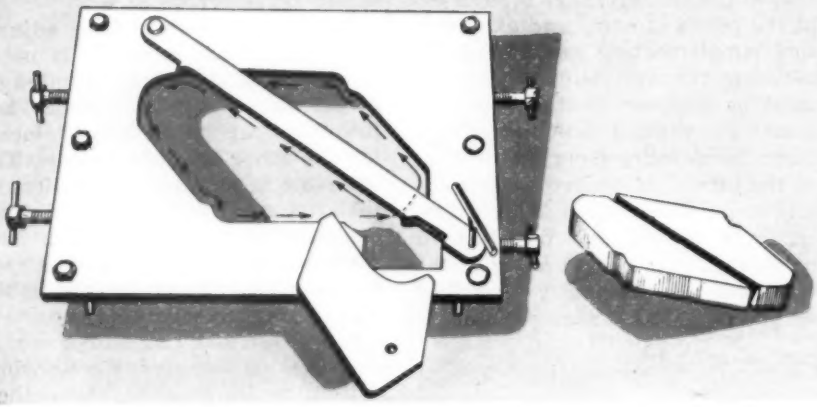
A templet which is both adjustable and readily movable is made in sections of steel strip mounted on points on a baseplate. Minor adjustments can be made by relocating the strips on their mounts. The baseplate is set on sphere rollers so that it can be readily moved from one position to another on a long tracing table, being clamped at each position to a flange on the table. This is used in quantity production where fresh plate is laid down at one point on the cutting table while cutting is in progress at another. The machine and templet are quickly moved to alignment with the fresh plate without waiting for removal of finished work, which is done by a crew of helpers.

A built-up templet, used for three separate cutting operations on tank sprockets, has a circular cam for cutting inside openings, a removable second cam for separating the plate into four individual sprocket blanks, and a cam for cutting the sprocket tooth outlines. The blanks are individually mounted on a different pair of worktables, four to a table, for the tooth profiling operation.

Multiple templets are used frequently to increase the work factor



The three-section templet mounted on the center table serves for making all cuts in the shaping of tank sprockets. Cam section indicated by arrow is detachable, and is used for severing plates into four blanks after circles have been cut. Machine and tracing table are moved to another pair of cutting tables for cutting sprocket tooth outlines



This dual templet is used to cut two identical parts, shown at right, in one continuous traverse of the torch. The tracer starts at the open gate and moves across diagonally on the long lever, then across and down at the left. The lever is swung out of the way, the smaller gate closed, and the tracer continues around counterclockwise until the cut is completed. Handscrews at both sides of templet frame clamp it to a channel which is fixed to the tracing table

of the cutting machine. These may be built up of two or more different cam shapes for making different cuts, as described in the previous example. More often they are identical, sometimes for the purpose of utilizing one section of the cut to provide cut faces for two adjacent parts.

Other types of multiple templets have movable gates to enable the tracer and the torch to move without interruption from the cutting of one piece to another. One type uses nesting both to save on material and to make one section of the cut serve for two workpieces. The possibility of utilizing this technique should be kept in mind when designing templets, because of the economies in material, gases and set-up time which can be gained. In designing such templets it is important to plan the route cf travel of the tracer in such a way as to keep the cut always on main material, and in particular to avoid making the cross cut after severance has progressed so far as to create some distortion.

Templets should always be made sufficiently durable to preserve their shape and accuracy for the duration of the cutting job. Hastily made templets frequently require correction after it has been proved on the job that small errors exist.

Yet it sometimes happens that the parts cut from a well made but improperly engineered templet will prove slightly "off" when fitted into a welded assembly, and the poor fitup necessitates excessive welding. This is unavoidable and is to be expected sometimes, and when it occurs it is far better to make corrections on the templet.

The next installment will cover costs of cutting, hourly production rates, and means of reducing costs.

RECONVERSION SECTION

Reconversion According to Plan

BY JOHN HAYDOCK, EXECUTIVE EDITOR, AMERICAN MACHINIST

V-J Day came suddenly and with it the complete cancellation of American Type Founders' orders for military products. Foresight on the part of management had furnished a program that is now aiding the task of reconversion

THE WAR put American Type Founders, Inc. into the munitions business; V-J day took it out again. This company affords a fine example of conversion and reconversion because of the wide differences between its wartime and peacetime productions.

American Type Founders got into war work gradually, principally because it got into it early. As early as 1939, when the European conflict started, its executive committee decided to bid on war contracts in order to educate its manufacturing personnel in the making of ordnance material. The first orders came from the British Purchasing Commission.

Other orders followed, until in March, 1942, the company was entirely out of the manufacture of printing presses, its regular business. From then on it was 90 percent war work, the only exceptions being a few repair parts for its outstanding press equipment and the operation of its type foundry.

Wartime Needs for Printing

It should be remembered that printing was classed as an essential industry during the war. The government itself used instruction books on virtually all its equipment; every shipment of munitions was accompanied by tags and slips identifying it and carrying directions for its use. Little need be said of the various directives and forms emanating from Washington. In addition, many kinds of private printing enterprises were also classed as essential, including such publications as this which instructed industry in the job of retooling for war work. Consequently type had to be provided and the existing press equipment had to be kept running.

For purposes of simplicity only the reconversion of the company's main plant at Elizabeth, N. J., will be considered. This plant consists of four shops: a press shop which was turned over to war orders of various kinds; a press rebuilding shop which was turned over 100 percent to the manufacture of shells; a type foundry which, because of the special character of its work was unchanged; and a gun shop built new by the company but equipped by the United States and British governments.

Wide Variety of Munitions

During the course of the war, American Type Founders engaged in the manufacture of scores of products required by this country and its Allies. To name a few: 8-in. shells, 37-mm. guns and tank mounts, 57-mm. guns, propeller shafts and ring gears for Rolls-Royce aircraft engines, propeller shafts for Pratt & Whitney engines in Navy planes, 57-mm., 75-mm., and 105-mm. gun recoil mechanisms, 3-in. Navy guns, Navy target designators, hinge pieces for the Grumman *Wildcat* airplane, various radar components, LeBlond cutter grinders and 10-in. Regal lathes.

There were some cutbacks on V-E day. But on V-J day the company received cancellations for all of its war orders. Thus, though the entry into war work was gradual, the exit was sudden and stunning.

Plan Put Into Action

The plant was shut down for three days in order to appraise the situation and to plan for action. However, this three-day holiday did not mean that the management was unprepared for the contingency, unexpected and dramatic as it was. For over two years prior to this date, the company had been planning just what it would do when victory came; all that was necessary was to set the prearranged machinery in motion along certain well-defined lines.

The immediate job was to get rid of war material in process and war equipment not needed for postwar use. Prompt plant clearance was essential to make room for the resumption of peacetime manufacture and to keep employed as many as possible of the company's manufacturing personnel.

Approximately a year before V-J day an engineer was put in charge of postwar planning. One of his accomplishments was to construct a model three-dimensional plant made out to a scale of ¼ in. to the foot. This model showed the end

PRESSES TO GUNS was the conversion theme of American Type Founders. Conversion to production of military equipment came gradually but steadily and stands out in sharp contrast to the need for immediate reconversion when ordnance contracts were cancelled immediately on V-J Day. The prewar output of presses (above) was transformed into wartime production of 57-mm. gun barrels shown being drilled (right). Reconversion planning effected a rapid return to peacetime manufacture of presses

objective in reconversion so far as plant layout and manufacturing equipment was concerned. It showed each piece of equipment in miniature and a color code indicated its source. Some of the machines were old American Type Founders' equipment that had been used during the war. Others were supplied by the various government agencies and the British Purchasing Commission. Still other machines on the model layout were new ones to be acquired after V-J day. The objective of the plan was to evolve a better plant with superior manufacturing facilities to those used before the war.

In the original conversion for war work, the press shop retained a good percentage of its original equipment in the same position that had been used for the manufacture of presses. The additional equipment that was needed for munitions was installed in assembly areas or in spaces not occupied by other machinery. However, in some instances it was necessary to remove the old equipment and make room for the new. The foresight back of this arrangement is helpful now in reconverting the plant to press manufacture. The gun shop and the shell shop, however, will be virtually cleared of equipment during the reconversion period.

One of the advantages to be gained in the new layout is an improved asembly plan which calls for the erection of heavy presses near the shipping area where they can be loaded on freight cars with a minimum of handling. As the plant had grown before the war, the heavy press division was located at the wrong end of the shop, a condition that was difficult to change in the midst of manufacture. Thus the reconversion period is advantageous in paving the way for a better work flow. Along these same lines, the

arrangement of machining departments has been improved, as this opportunity really constitutes the beginning of a new era in the company's history.

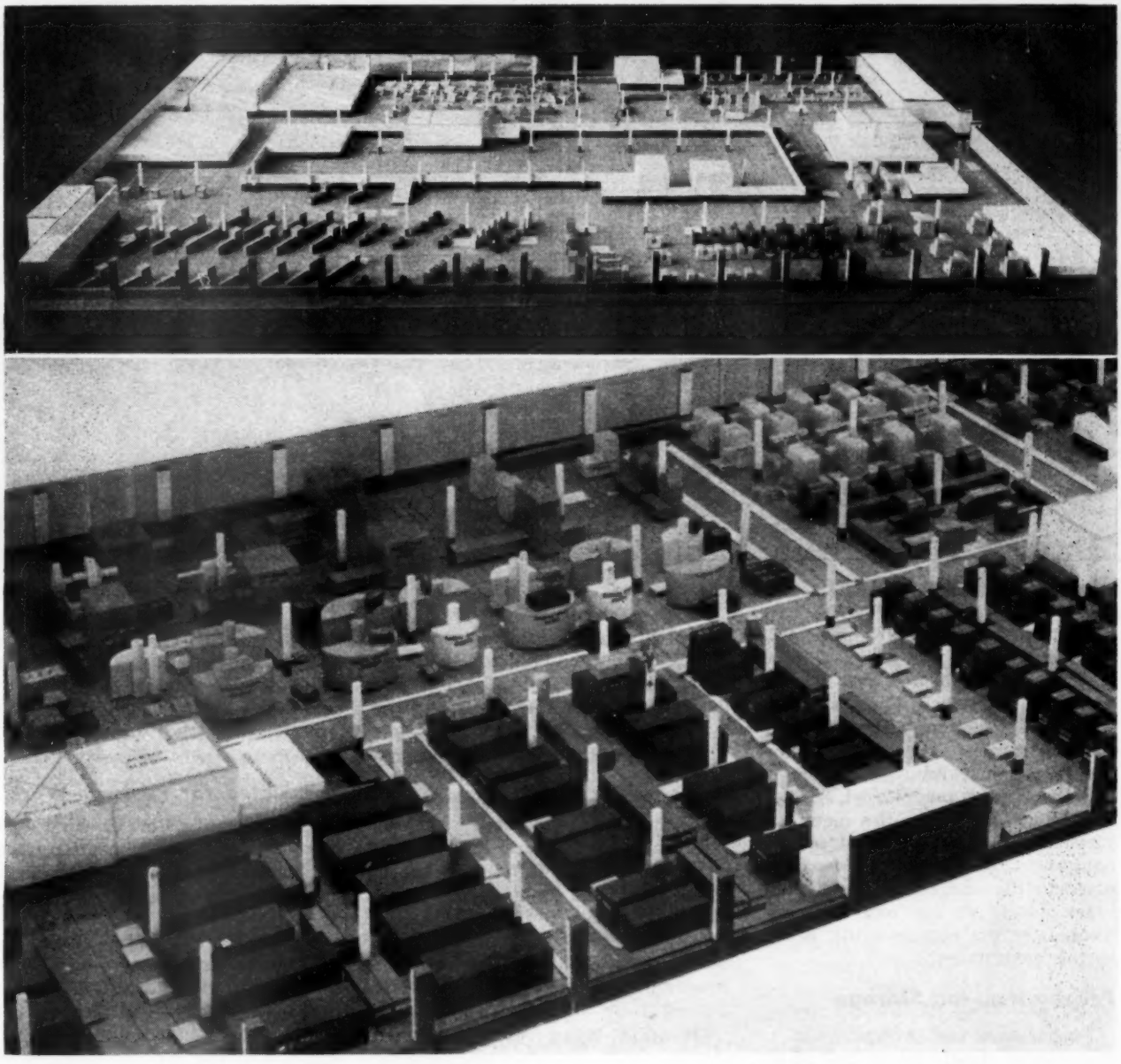
The model plant layout was not kept under lock and key. Foremen and superintendents were encouraged to view it and to give their suggestions for its improvement. In the course of weeks, many arrangements were tried; each was photographed to give a permanent record before reshuffling the model equipment to a new projected layout. Model machines can be shifted from one location to the next at no cost, but the transfer of their full-sized counterparts from one foundation to another is expensive. The model plant has already repaid its original cost many times over; its use will result in an ultimate plant arrangement far better than any that could have been devised without it.

Thousands of Items Listed

Total government-owned manufacturing facilities in the Elizabeth plant of American Type Founders reached the staggering total of 100,000 items. These included all kinds of small tools, gages, jigs and fixtures as well as large units of equipment; but each had to be inventoried and its condition noted. One government agency requires that 80 forms be filled out on each major manufacturing facility. These forms record the complete history of each piece of equipment and the use to which it was put.

During the war, the company acquired through government channels some 700 units classed as major facilities. Of these about 450 were machine tools; the rest were cranes, shop trucks, large testing machines, dustproof rooms, furnaces and other large items. Such equipment takes up a lot of room, and until most of it is removed, peacetime production is handicapped.

Fortunately the company's prepar-



THREE-DIMENSIONAL model plant layouts aided immeasurably in reconverting the American Type Founders' plant from production of military items to presses for peacetime markets. An improved assembly plan and rearrangement of machining departments resulted from study of the model layouts. Foremen and superintendents suggested improved arrangement of the models

INSPECTION OPERATIONS in press manufacture were altered to suit the requirements of gun barrels and other munitions production. Three inspection phases performed on 55-mm. gun barrels are depicted. The illustration at the left gives some indication of the tremendous amount of armament turned out during the war

atory work had predetermined just what equipment was to be retained and what was to be declared surplus. Speed in making up one's mind on this point is most important because the government is allowed 60 days before it must remove equipment after it has been inventoried, skidded and declared surplus. If a manufacturer elects to move or store this equipment before its release, and prior to the end of this period, he must do so at his own expense. Thereafter the responsibility passes to the government.

Preparation for Storage

Preparation for storage must be done under rigidly prescribed directions contained in government Bulletin PS 300. Certain specified portions of each machine must be covered with waterproof material, exposed surfaces slushed and the machine mounted on skids. Cutting, lubricating and hydraulic oils are drained from machine tools and the systems are flushed out.

Disposal of the oil in itself became a problem. It could not be put in the city's sewers and there was no place to dump it. Finally one ingenious engineer thought of the New Jersey State Mosquito Commission. A telephone call found the Commission not only willing but eager to use the waste oil. So this surplus will now be used to spray the larva-breeding meadows in the battle against New Jersey's famous pest.

Of some 450 government-owned machine tools installed in the company's plant, 53 were selected for retention. Purchases will be made from government agencies in accordance with the so-called Clayton formula which fixes standard rates of depreciation and which has been well publicized. British-owned equipment is acquired by direct negotiation with the Purchasing Commission.

Not Suited for Postwar Work

The percentage of machine tools retained by the company may seem small. However, much of the war-installed equipment was special—deep-hole drilling machines, rifling machines, long honing machines, large thread-milling machines and many others usable only for guns, gun mounts and recoil mechanisms. Other equipment, while standard, was not of the type or size needed for the company's peacetime products. Still other machine tools were not deemed sufficiently accurate to meet tolerances on press parts.

American Type Founders' prewar equipment and that acquired from the government agencies will be supplemented by purchases of machine tools. These will be standard precision machine tools and special machines needed for printing press manufacture.

Terminations and cutbacks on V-E day made it possible to mark as surplus some manufacturing facilities at that time. A crew of 20 men was put to work preparing these machines for storage in accordance with government specifications. These men gained the know-how of machine protection. After V-J day, 100 more men were added to the crew while members of the original force became group leaders. The preparation of equipment for removal has progressed faster than the government can dispose of it. The responsibility for properly preparing machines remains with the company even after they are passed by government inspectors.

Superimposed upon the job of equipment disposal was that of clearing the plant of material in process. Since the company's orders were stopped short, no more work could be done on them, not even painting those components on which machining had been completed.

No Pretermination Agreement

Because of the number of contracts and the variety of procurement agencies dealt with by American Type Founders, a pretermination agreement was not feasible. On V-J day, the company had about 72 open contracts covering approximately 60 different products. The Ordnance Department, the Army Air Corps, the Signal Corps, the Navy and the British were all involved. In addition many portions of these orders were subcontracted to outside concerns, other company plants or subsidiaries. American Type Founders in turn was itself a subcontractor on other orders. (An article describing this company's plan for coordinating the work of its subcontractors appeared in these pages two years ago.)

A pretermination agreement is possible and advisable when the order book is fairly simple and the contracts, however large, are for one or a small number of products. There was no possibility of deriving a formula as a basis for a pretermination agreement in the case of this concern. The only method open was the hard way of taking inventory and determining the state of completion of each part in process.

Here again preparatory planning proved helpful. A Termination Division had been set up in the company two years in advance, and a standard procedure had been prepared. A Disposal Section was trained to take inventory, and an Accounting Section was schooled in the intricacies of preparing claims and arranging for payments. It should be remembered that it is not sufficient to go through the plant and take inventory on all terminated orders. Every item must be listed, contract by contract, and agency by agency. Each agency has its own set of forms to be filled out and they are not uniform. Each item in process must be certified as to its degree of completion by a government inspector.

When the final terminations came over the wires on V-J day, all department heads and subcontractors were notified at once. Shop orders were cancelled and work was halted. The Termination Division set up a central file to record the findings.

Clearance Moves Slowly

The task is a huge one, and to plant executives anxious to maintain maximum employment and to get into postwar production, it often seems painfully slow. Little fault can be found with the government agencies; they act promptly as possible when the required information is properly presented to them. This company's case is multiplied by hundreds so far as these agencies are concerned, and all the reports and claims are coming in at once. Inherently it is a detailed and tedious job; it may take six months before the plant can be completely cleared of war materials.

This does not mean that the management is waiting. Already it has commenced actual operations on the production of printing presses. Foundry orders, buried beneath a mountain of priorities before V-J day, are beginning to be filled. Partially finished components, put into storage when the stop order on printing presses was issued early in 1942, have been put back in work. War equipment and parts are in the way, but they are moving out gradually, and production is expanding despite them.

Sales Force Kept Busy

Manufacturing plans were aided greatly by the company's wartime sales policy. In 1943 a Civilian Products Delivery Plan was devised; in effect it gave customers the opportunity to place orders for postwar delivery and thus establish a priority on the company's books. No prices were quoted, and orders are revocable by either party on 60 days notice. These orders give the plant something to start on and indicate the sizes of presses for which the demand is the greatest. They also served to hold together the American Type Founders sales organization.

Prewar the company employed about 250 sales and service men in its branch offices. Selective service, war jobs and normal turnover reduced this force by some 35 percent. There was plenty for the service men to do in keeping old presses in operation, many of which would have been replaced in normal times. The Civilian Products Delivery Plan kept the remaining salesmen busy, thus keeping intact the nucleus of a postwar distribution force.

New Products Developed

The company has a New Products Division which discovers and develops things which fit into the available manufacturing facilities. These products are not turned over to the plant for manufacture until all market studies and development are completed. Already a line of induction heating machines has been announced. Prior to V-J day a limited number of these units were assembled in an outside plant. Now they will be built in a portion of the former gun shop. Meanwhile the demand for printing presses has reached a peak because of the deferment of orders during the war years.

Sensitive Drilling and Tapping in a Lathe

DONALD R. TRYER
Oregon Brass Works, Inc.

BECAUSE of the stiffness of the tailstock spindle and handwheel assembly, it is usually difficult properly to feed a small tap, for instance, into soft work without stripping the threads.

A simple remedy is to remove handwheel, collar and screw leaving the spindle to slide freely. For light work, then, the spindle or chuck can be fed by hand with far greater control than is otherwise possible, as the tap will tend to follow its own lead through the soft work piece.

FOREMAN'S ROUND TABLE

How About An Annual Wage?

"WHAT'S THE IDEA of shooting off your head about a big layoff the other day, Ed?" Al, coming into the toolroom from the shop, had an ornery look. "With all that guff about no work until you guys get the place retooled, you scared the wits out of Ben Duffield. He already sees himself selling apples."

"Everybody should keep his eyes open, Al. There's no use making out that the cushy wartime checks will keep right on coming in. If Ben hasn't thought about it before, he'd better start. So should the rest of your boys."

"Yeah, Ed, I know, I know. But you don't have to be a Calamity Jane in overalls. Ben had to buy a house at a fancy price—or have his family sleep in the park. He's paid on it already for a couple of years. If he gets laid off now, he'll be right back where he started."

"That's his problem, Al, not mine or yours. He should have realized the high pay couldn't last—and might even stop. That's a chance we all have to take. What should the company do, stand back of Ben's optimistic guesses? They might as well buy him a house and be done with it!"

"No, Ed, that isn't any good. I don't believe in company houses any more than you do. But I think the company could give all the oldtimers some kind of guarantee of work by the year."

"Oh, that's your notion, eh, Al? Push the company back into the business of playing rich uncle to everybody that works here! The next thing you'll be yelling for is company scholarships for your kids."

"Grow up, Ed, I'm just suggesting that some kind of a guaranteed income would keep us from losing good men every time things slow up, and at the same time give men like Ben some security."

"Why nuts, Al, you just want the company to set up some more unemployment insurance. Nobody guarantees their business; how can they guarantee anybody's income? And no guy with any sense or self-respect expects it."

"Look, Ed, it's already being done by a lot of plants in the food, chemical and leather lines. If they can do it, why can't a company like this one?"

"Al, those companies have peaks and valleys in a year—ours may be a couple of years apart. We can't spread work over that long."

"But we can find things to make to fill the low spots, or build for stock, Ed."

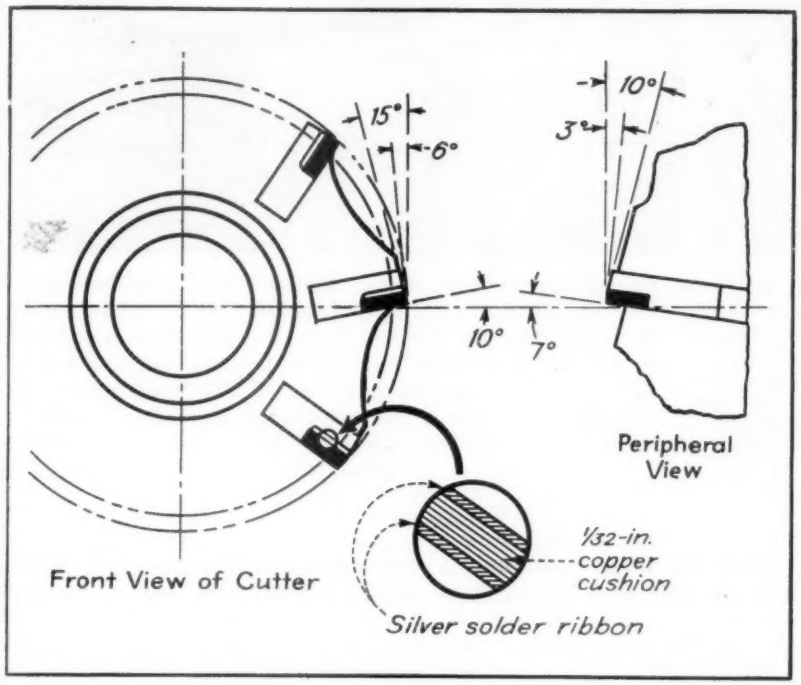
"Now, you're in favor of a postwar WPA. What are you doing, running for sheriff or starting a nursery for mechanics?"

WHAT DO YOU THINK *about an annual wage in metal-working plants? Is it practical? Is Ed's argument about the longer cycle in capital-goods plants sound? In other words, might metal-working plants producing consumer products be able to work out wages by the year, while those producing machinery and shop equipment could not? Would it help keep good men happy where they are? Send in your ideas and opinions. Those published will be paid for.*

Table Feed Increased 15-Fold With Negative-Rake Cutters

BY J. O. HOLMES, Master Mechanic, and
R. C. HOLLOWAY, Superintendent of Small Tools
LINDEN PLANT, EASTERN AIRCRAFT DIVISION
GENERAL MOTORS CORPORATION

With carefully ground cutters having cushioned carbide-tipped teeth, it is possible to take fairly heavy cuts in alloy steel in one pass and get good finish



Face-mill and straddle-mill cutters are made with 7 deg. negative helix and 10 deg. negative rake, as standard. By cushioning the tips, tooth life is 20 percent greater, and cracking during grinding is practically non-existent

A MUCH-DISCUSSED subject during the war, negative-rake milling will undoubtedly have broader application and development in connection with the manufacture of peacetime goods. Those who contemplate adoption of the process may profit from the three-year experience of the Linden Plant, Eastern Aircraft Division of General Motors. Our production research upon the possibilities of negative-rake milling was concerned solely with increasing output of fighter-plane parts, despite the limited number of No. 3, 4 and 5 knee-type millers available in the shop. But the production-proved results obtained should be of interest because similar conditions of work load and machine equipment are present in many other plants.

By the time that we had stabilized our set-ups for face-milling, straddle-milling and side-milling operations on aircraft structural parts, it was evident that output could be increased up to

MILLING VARIOUS MATERIALS WITH NEGATIVE-RAKE CUTTERS

Material	C. R. Steel	Boiler Plate	Stainless Steel
Cutter diam, in.	8	8	8
No. of teeth	14	14	14
R.p.m.	414	414	414
S.f.p.m.	867	867	867
Table Feed	24¾	20	15⅝
Cut per tooth, in.	0.005	0.0042	0.0031
Depth of cut, in.	⅛	3/16	3/16
Width of cut, in.	2	2	1¼
Pieces per grind	163[1]	76[2]	76[2]

[1]Cutter dull, ready for regrind
[2] and [3] Cutter dull, but in fair condition

FOREMAN'S GUIDE FOR MILLING CHROME-MOLY PARTS WITH NEGATIVE-RAKE CUTTERS

Part No.	Operation	Spindle Speed r.p.m.	Table Feed In.	Cutter Diam. In.
1 to 5	Face Milling	400	21	8
6	" "	879	17½	2¼
7	" "	489	17½	6
8	" "	545	15	6
9	" "	400	25	8
10		445	21	7
11	Straddle Milling	326	17½	9
12	" "	545	60	12
13	" "	200	20	9
14	Side Milling	400	21	8

Note: These speeds and feeds are good for one pass, removing ⅛ to ⅜ in. of material.

Facing wing hinge. Material: SAE 4140; tensile strength, 105,000 p.s.i. Carbide-tipped end mill: 2¼-in. diameter; 4 teeth; 7-deg. rake, 7-deg. helix angle. Details of operation: spindle speed, 879 r.p.m.; table feed, 17½ in.; depth of cut, ⅜ in.; pieces per grind, 112; coolant, none; finish good, no burrs. Former set-up with high-speed steel cutter: spindle speed, 24 r.p.m.; table feed, 1½ in. per min.; pieces per grind, 50; coolant soluble oil

Facing engine-mount fitting. Material: SAE 4140; tensile strength, 105,000 p.s.i. Negative-rake, carbide-tipped cutter: 7-in. diameter, 8 teeth. Details of operation: spindle speed, 445 r.p.m.; table feed, 21 in. per min.; depth of cut, ¼ in.; coolant, none; pieces per grind, 122. Former set-up with high-speed steel cutter: spindle speed, 45 r.p.m.; table feed, 1½ in. per min.; coolant, soluble oil; pieces per grind, 48

15-fold by changing only these factors—cutter, spindle speed and table feed. The fixtures were unchanged. Automatic loading and indexing arrangements would have still further reduced the floor-to-floor time per piece, but our lot sizes did not justify the tool design expense.

Besides the gain in output, we found that negative-rake milling much improved the finish. In fact, milled finishes approximating ground finishes were common. Cuts, from 1/8 to ⅜ in. in depth, in chrome-moly steel were made in one pass. Yet despite cutting speeds of 800 to 1,000 s.f.p.m. and table feeds averaging 21 in. per min. on alloy steel, the number of pieces per grind obtained with negative-rake carbide-tipped cutters averaged at least twice as many as we formerly secured with high-speed steel tools.

In our original experiments with negative-rake cutters, cutting speeds up to 1,285 s.f.p.m. and a chip thickness of 0.002 in. were used. Later we eased off the speed to about 1,000 s.f.p.m. maximum and increased chip thicknesses where possible. Finally, we were operating at table feeds from 5½-30 in. per min. as compared with 7/16-2 in. per min. with high-speed steel cutters and used a chip thickness up to 0.0045 in. per tooth.

We never had good luck with conventionally ground carbide cutters—the tip breakage was too great. So by tests we found that a 7-deg. negative helix angle and a 10-deg. negative rake gave the best results on chrome-moly steels. Later we used the same tool grinds for other materials. Experiments on milling aluminum disclosed that it is possible to use negative rake with the advantages of better finish and reduced cutter inventory.

Careful Grinding Essential

The grinding of carbide-tipped tools must be done carefully. If silicon-carbide abrasive is used, the wheel breaks down before the cutter is finished and the teeth are of unequal length. We controlled tip length between 0.0003 to 0.0005 in. by using diamond-impregnated wheels for finish grinding.

A 20 percent gain in cutter life was realized by cushioning the tips. A 1/32-in. cushion was adopted as standard. Cushioning is of value when grinding the cutter, because there is less likelihood of setting up strains in the tip to cause cracking when the tool is put in service. And losses due to cracking while grinding are made practically non-existent by the tipping precaution. All cutter teeth were ground with a 45-deg. chamfer to reduce the load on the milling machine, except that a radius was ground when fillets were required on the workpiece.

Consistently good production results were obtained by exercising care to see that arbors ran true and cutters were checked for run-out after mounting on the machine.

It was our feeling that the power increase with negative-rake milling is no problem, considering the cutters one is likely to mount on a late-model machine. Great variations existed in horsepower drawn with dull and sharp cutters. For example, in one test a sharp cutter required 13.4 hp.; a dull cutter, 24.3 hp., but the 20-hp. motor was well able to with stand the overload, which was of short duration because of the greatly increased cutting speed of the carbide tool.

Practical Ideas

HAVE YOU A PRACTICAL IDEA? . . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Slots Milled in Beryllium-Copper Tubes Without Causing Deformation

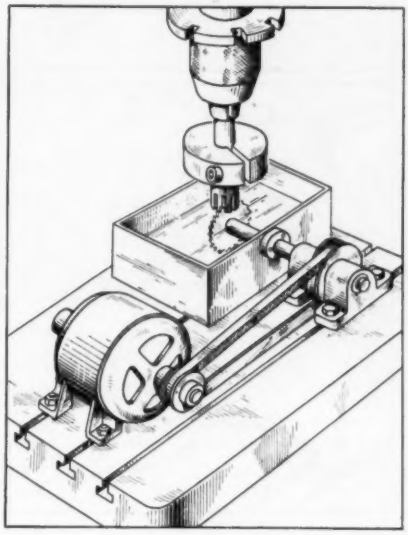
BY JOHN J. O'WRIL

It was necessary to mill eight slots in the end of beryllium-copper tubes without changing the shape of the tube. Various methods were tried without success. Feeding the tube into the cutter, in an effort to cut two slots at once, collapsed the tube and bound the saw; feeding the saw into the outside of the tube pushed in the wall and bound the saw; internal and external supports did not produce satisfactory results. Finally, the work was set so that the cutter was partly inside the tube and the rotation of the teeth was into the inside wall of the tube and the feed was outward; this method produced the best results.

A gear was fastened to the quill of a drill press and a pull pin, for indexing, was fastened to the drill press housing. A cast-iron block was turned to fit the drill chuck and a concentric hole bored to receive the bushing. A slot was cut into the block and provision made for binding screws which were used to grip the tubing rigidly.

The slotting saw drive was accomplished by an arbor passing through a watertight pan but supported by bearings on the outside. This arbor is driven by a motor through a V-belt passing over sheaves. The watertight box must be high enough to submerge the cutter halfway. The watertight box, cutter arbor and its bearings with the motor and its drive are mounted on the bed.

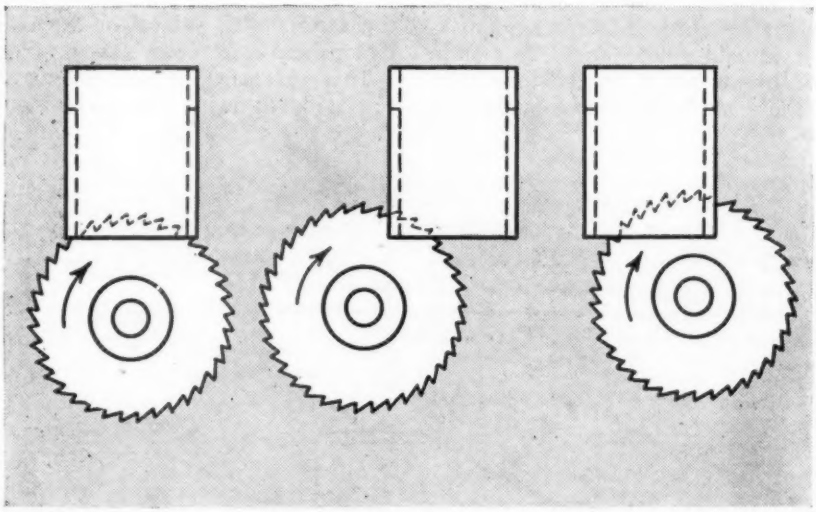
The principle of operation is to grip a tube in the split bushing, feed down the non-rotating drill spindle until the correct depth of slot has been cut, withdraw the spindle, index the spindle by use of the gear and pull pin, then repeat the process.



Beryllium-copper tube chucked firmly in especially made cast iron collet. Drill press table carries cutter and drive while spindle feeds and indexes work

By submerging the cutter in coolant, the heat due to cutting is quickly carried away from the tube.

This set-up permitted the cutting of 4000 slots ½ in. deep at one sharpening of the saw.

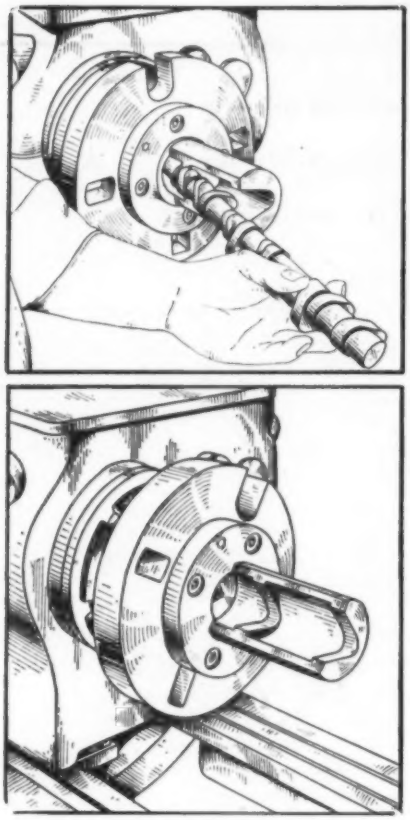


First method of feeding the work down into the cutter collapsed the tube and bound the saw; the second method pushed in the tube wall and bound the saw; best results were achieved when the third method was used to begin cutting from inside the tube outward

Machining Operations Shortened By Faceplate Fixture

BY JOSEPH ZELENAK
Tool Designer
Packard Motor Car Company

Machining the ends of a gasoline engine camshaft usually required the use of a lathe dog fastened to the driving end while the shaft was supported between centers. In this condition, the lathe dog frequently loosened and the centers could not be made too tight because of change in length due to the increase in temperature of the shaft; also, after one end was machined, it was necessary to take out the shaft, place the dog on the opposite end and machine the rough end. All this re-



A semi-tubular fixture, attached to the face plate, has spaces into which several of the cams fit; these cams drive the camshaft when it is mounted between centers

quired much time and slowed production.

To overcome these disadvantages, a fixture was made which utilized the cams at each end of the shaft. The fixture was fastened to the faceplate as a driver, room was left for the live center, a semi-tubular section had space provided for cams at the end of the shaft, these cams contacted the cavities in the fixture and drove the shaft.

To machine the camshaft, one end is placed on the live center and the end cam or cams fitted inside the semi-tubular fixture, the other end is placed on the dead center. The semi-tubular section drove the camshaft while machining is done on one end; when the other end is to be machined, the camshaft is reversed and the work done. In this process, a lathe dog is not required, there is nothing to come loose, a positive drive occurs all along the line. No time is required to loosen or tighten driving dogs. *Suggestion from the Board for Individual Awards, War Winning Drive.*

Honing Machine Stones Fully Utilized by Reworking the Wedges

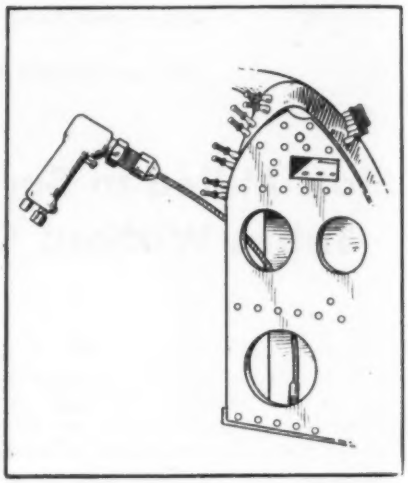
BY GUS SUNDBERG
Ford Instrument Company, Inc.

Honing stones are long, narrow and not too thick. Because of the customary arrangement of the stone-expansion wedges, not all of the stone is used up. Thus, frequent stone changes are necessary when they become thin. Longer service could be obtained if the wedges were altered to utilize all of the abrasive.

Due to the fact that many types of wedges are used, there are different methods of obtaining additional wear of the stone. If a long, slender wedge is the compensating feature, reduction of the wing at the end permits additional use of the stone. When a stepped wedge is used under the stone, permissible wear of the stone is about half the original thickness when the wedge is moved to its limit. Further use of the stone can be obtained by shimming between the wedge and mandrel; this requires reducing the height of the land nearest to the adjusting link. The height of this land must be reduced a trifle more than the thickness of the shim. This is necessary to permit the land of the wedge to pass under the stone and not interfere in any way with the movement of either.

If a ⅛ in. shim is used under the stepped wedge, the land nearest to the adjusting link is machined off this amount plus some clearance, but the other lands are shortened in height not quite the same amount as the adjusting-link land. This shim will use about all of the stone.

These alterations have made possible the use of practically all of the stone. *Suggestion from the Board for Individual Awards, War Production Drive.*



A flexible extension to the pliers will bend enough to enter inaccessible places when fasteners are placed or removed

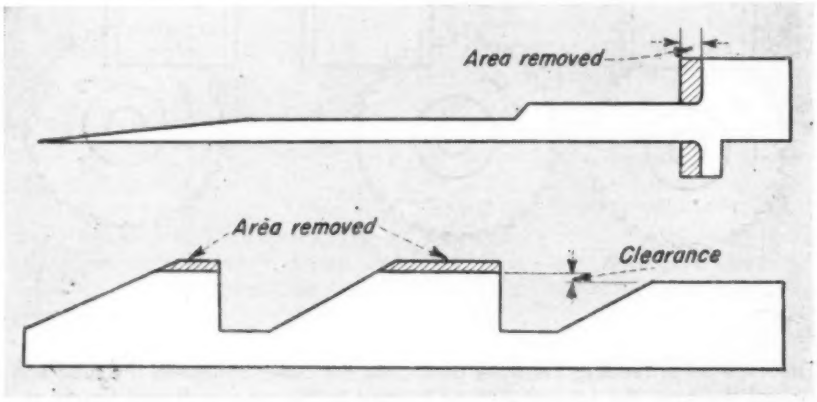
Tool for Inserting or Removing Fasteners in Difficult Places

BY B. R. NAWROCKI
Curtiss-Wright Corporation, Kenmore Plant

There are numerous places in airplane assemblies where fasteners must be used to hold sheets in place, but these fasteners can be placed in position only with difficulty.

By the use of a flexible extension to the pliers, it is possible to place the fasteners in out of the way locations and also remove them.

This extension is not expensive, but it saves many thousand man-



Thin wedge (top) cut away to allow more travel. Step wedge (below) has full length shim underneath

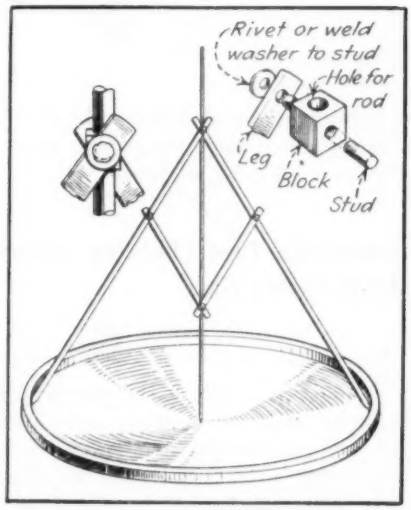
hours per year in addition to possible damage to some part due to disassembling in an effort to remove a fastener. *Suggestion from the Board for Individual Awards, War Production Drive.*

Bisecting Dividers Locate Centers of Large Circles

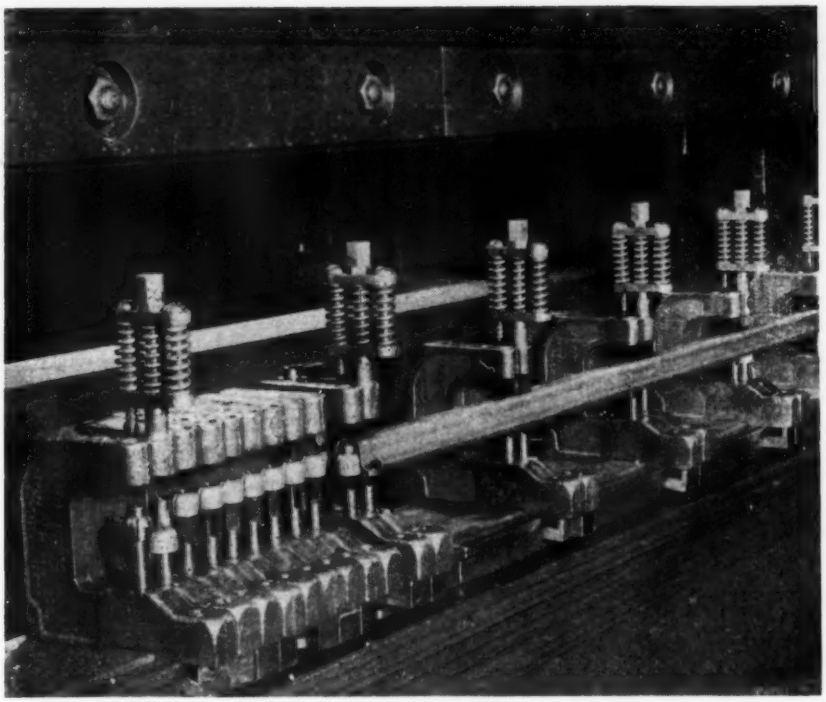
BY EDWARD DISKAVICH

To locate the centers of very large circular basins, domes, or plates, a device utilizing a rhombus was constructed. In operation, one leg is held stationary at the periphery while the other is made to follow the edge approximately opposite. Because the rod is automatically spaced midway between the legs, it will be tracing an arc which will pass through the center just as the moving leg passes the point of greatest span. When the procedure is repeated at a point about 90 deg. away, the two arcs obtained have intersected in the exact center, discounting the mechanical errors which should be slight.

The drawing indicates the construction used although there are probably several ways equally satisfactory. It is, of course, essential that symmetrical parts be identical. The only other requisites are that the studs and rivets be tight to assure permanence, and that the holes for the sliding rod be just large enough to permit it to pass freely and yet not loosely.



Large dividers constructed from cold rolled strip and drill rod



A split bushing, pushed over the die, fits inside the hat section and aligns the shape for accurate punching

Holes Punched in Hat Section With Locater on Brake Dies

BY G. R. CASTLEMAN
Douglas Aircraft Co., Inc., El Segundo

Long sections formed from sheet metal will have twists due to unrelieved stresses; straightening does not always prove to be a cure; punching holes under these conditions produces unsatisfactory results.

When it becomes necessary to punch many holes in shapes and have these holes line up correctly with proper spacing, a type of guide or locater is required on each adjustable punch and die outfit so that when the punch descends upon the metal shape it will settle itself into position upon the die.

Adjustable dies are capable of being moved into any longitudinal direction along the bed of the brake, their width is consequently limited, and the locater is restricted in size.

To take care of manufacturing irregularities, a split spacing sleeve is slipped over the die, but it fits the interior dimensions of the shape snugly. For the hat section under consideration, round split bushings, with an undersize hole, are pushed over the protruding die. When the long section is placed on the brake for punching, some hand adjustment may be required to push the shape into position, but the metal is pressed down against the die when the punch strikes the surface.

This method permits a large number of holes to be punched at one time with the assurance that they will be accurately aligned; it omits the setup time previously needed. *Suggestion from the Board for Individual Awards, War Production Drive.*

Ends of Cylindrical Gages Ground Flat and Square with Accuracy

BY L. KASPER

Here is a method for grinding the ends of small cylindrical gages square and flat to within 0.00005 inch. The question was not only the way to check such accuracy, but how to set the grinder to produce it.

The parts were held in a collet in the grinding machine head and, after grinding the cylindrical surface, a trial cut was taken off the end. The end was then checked with a gage block. The gage block was first checked with an optical flat to determine its degree of flatness, after which it was given a light coating of blue. The procedure for coating

the surface of the block was to rub on a small quantity, then wipe it off on a piece of smooth paper held on a surface plate: the remaining blue appears as a dullness or slight oiliness on the surface, just enough to discolor the work surface slightly when brought into contact with it.

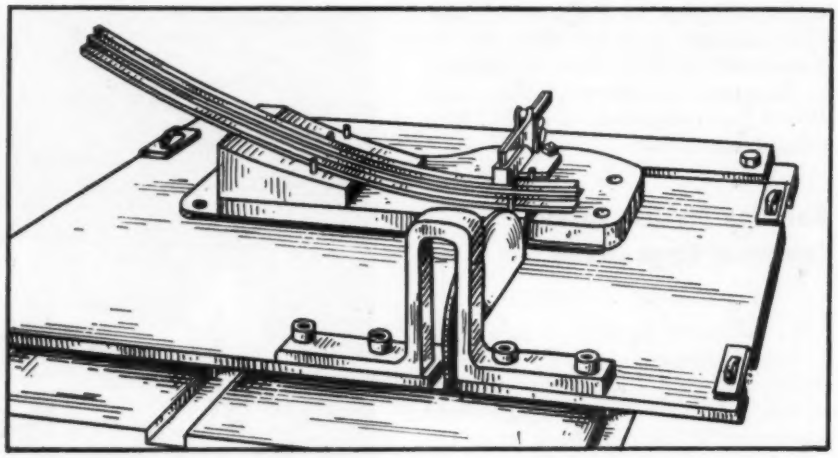
The usual assumption is that if the cylinder is first ground parallel axially, perfect squareness and flatness of the end is assured. This is not the case because axial and radial movements on any machine are accomplished by the use of two separate sets of slides or shears. Unless these slides are exactly at right angles to each other (they usually are not) to within the required tolerance, accurate work cannot be produced.

Some grinders have heads which can be swivelled, others swivel the table, an engine lathe with a portable grinder on the compound can also be used for grinding square and flat ends; but in each instance some adjustment must be made to the cross-slide before perfect flatness can be attained.

After a trial end cut, the coated block is rubbed against the surface to determine its flatness. If a line results, the surface is a convex cone; when the flat bears against the outer edge and a ring is produced, the end surface is a concave cone.

From the trial cuts, adjustment can be made until the flat contacts all over; this means adjusting the grinder head a minute amount. It is quite apparent that this method will produce as flat a surface square with the axis of rotation as can be obtained, because they are both produced without changing the setting of the workpiece.

Extreme care is required, of course, in guarding against backlash, if such accuracy is the goal.



A rolling saw table, guided by bars in slots, can be used for a variety of uses by providing types of holders to locate the workpiece

Combination Saw Fixture for Cutting Unusual Shapes

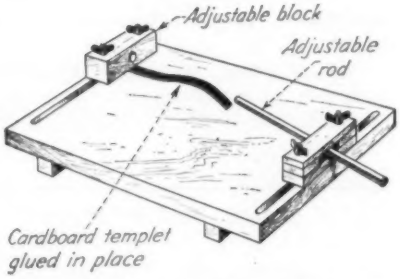
BY ROBERT L. STEELE
Northrop Aircraft, Incorporated

The fixture consists of a steel base rolling on ball bearings, guided across the saw by bars fitting into slots in the saw table but attached to the bottom of the steel base.

On the top of the base can be mounted many types of fixtures for holding pieces to be cut. Where right- and left-hand parts are to be cut, symmetrical holes are drilled on each side of the saw slot.

Types of jigs are made to fit some special shapes or groups of similar forms. These jigs are fastened to the baseplate by screws or bolts: stops are located on the jigs to position the piece to be cut, and a cam or toggle clamp holds the piece in place while the table is moved forward so that the saw can do its work.

Such a rolling baseplate, with groups of holes for several kinds of fixtures will find a broad range use for many simple operations. *Suggestion from the Board for Individual Awards, War Production Drive.*



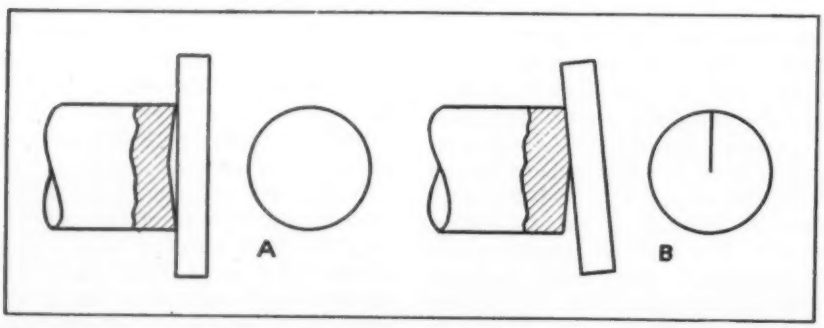
Slotted table and sliding rod permit many adjustments for gaging wide variety of tubes

Adjustable Tube Checking Fixture Saves Fitting Time

KENNETH BECKSTROM
Douglas Aircraft Co., Inc., Santa Monica

When many pieces of preformed pipe or tube are needed, some kind of semi-permanent or permanent checking fixture is required. This unit was designed to be adjustable, thereby stretching its application over a variety of jobs as designs change. It would be of particular value, for instance, in the building of diesel engines when the work is of a "custom built" nature and perhaps only 20 or so short lengths of injection tubing are required at a batch.

The checking fixture consists of a flat plate with slots cut in each end. One end is fitted with a block and



Flatness test—A circular line contact "A" indicates concavity of the gage end; a single line contact "B" indicates convexity of the surface

two clamping screws as shown. This block could have several sizes of hole drilled in it (blind) to receive the standard tubing sizes and more blocks could be provided as requirements grow. The other end has a block provided with a cover which receives a piece of rod to be used as the length gage. The block is designed so that the rod can swing in a wide arc, and tightening the nuts on the cover positions the rod and clamps it in position.

In use, a templet for the required piece is laid on the fixture table, the hole block clamped first, and the rod adjusted to meet the end of the piece in correct alignment. When the bend itself is not critical, the templet can be disregarded, but for complicated bends and reverse curves, and especially when the bend must fit into confined space, some form of templet will be required. The templet material and method of securing can be determined by judgment.

Collet Type Indexing Fixture for Production With Accuracy

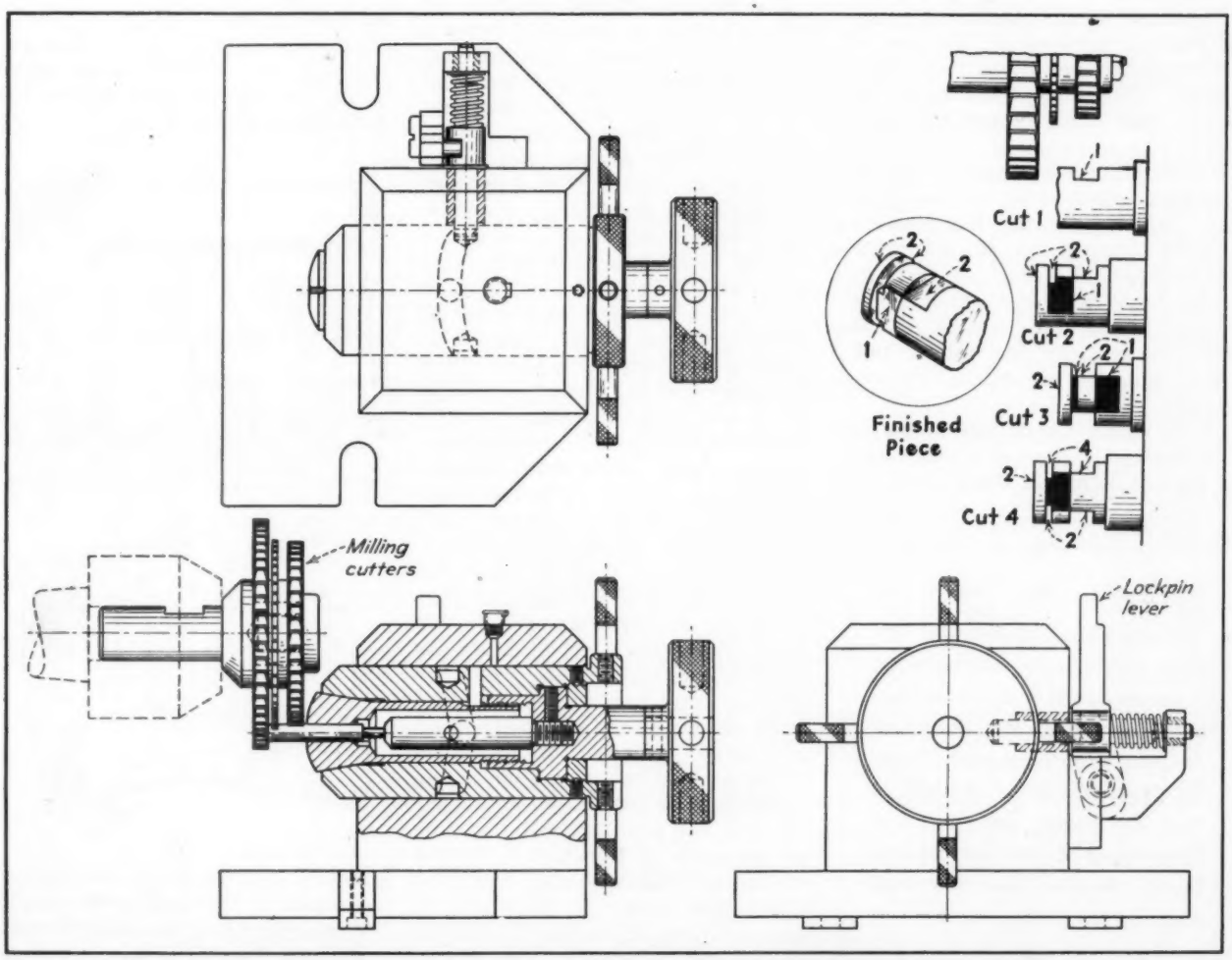
BY EDWARD LAY
Supervisor of Tool Design
Fairchild Camera & Instrument Corporation

Quantity production was required on a small cylindrical workpiece which had to have flats cut on four sides all accurately at right angles. Opposite faces are identical but adjacent ones are not.

This fixture built for a milling machine, has a draw-in collet that can be indexed in 90 deg. steps and slide axially at the same time. The collet and handwheel are of conventional design, but a stop pin is included which correctly locates the new piece longitudinally each cycle. This assembly is carried in a sleeve, which, as it revolves, is shifted axially by a spring-loaded indexing pin traveling in a groove milled in the surface of the sleeve. At the two opposite "in" positions and the two opposite "out" positions, the indexing pin drops into a locking hole.

Three plain milling cutters are ganged on the arbor, so selected and spaced that shifting the piece in and out is all that is necessary to obtain the different cuts required.

The sequence of operations is of no importance; work can be started in any of the four positions and carried through until completed. After the piece has been inserted, placed against the stop, and the handwheel tightened, the table is started and the first pass then cuts one wide notch near the end. The indexing lever, which lifts the pin from the locking hole, is then pulled and the sleeve is rotated with one of the four handles until the pin drops into the next hole. The next cut finishes off the end, cuts a deep narrow notch into the space just previously cut, and makes a third notch identical to the one of the previous operation. The third and fourth cuts repeat the first and second cuts on the two remaining sides.



Milled slot in sleeve shifts work in and out as it indexes, enabling different cuts with one set-up

The work change is the only stoppage required, and passes are taken into both directions with only the quick indexing after each pass, thereby cutting dead time to a minimum.

Self-Adjusting Vise Fixture Holds Pieces During Machining

BY R. J. DE LUCIA

This easy-to-make fixture, practical for short-run jobs, clamps several pieces at one time quickly and uniformly despite variations in part dimensions.

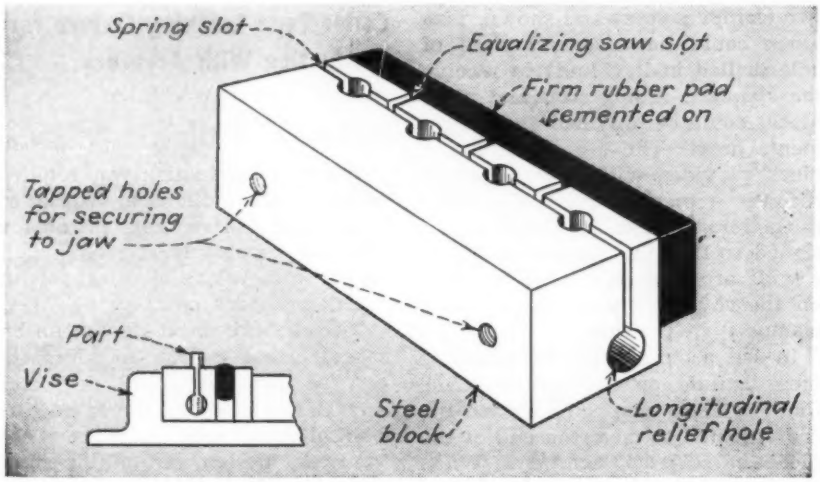
The springing jaw is prepared by first drilling the longitudinal relief hole. The simplest way to make sure the pieces will all be clamped at the same height is to drill the vertical holes clear through, allowing the parts to rest on the vise bed. Therefore, the relief hole should be slightly larger than the parts to prevent distortion or damage to parts in clamping.

The limit to the number of vertical holes is dictated by the size of parts and the operations to be performed. The hole diameter is, of course, just large enough for easy clearance.

The longitudinal slot providing the springing action is shown, and the slots which permit independent clamping are cut into the center of the longitudinal hole.

The force of the vise screw is equally transmitted to each of the split segments by the rubber pad which absorbs all minor irregularities.

If the parts are delicate, soft, or well finished, brass would obviously be preferable as the jaw material.



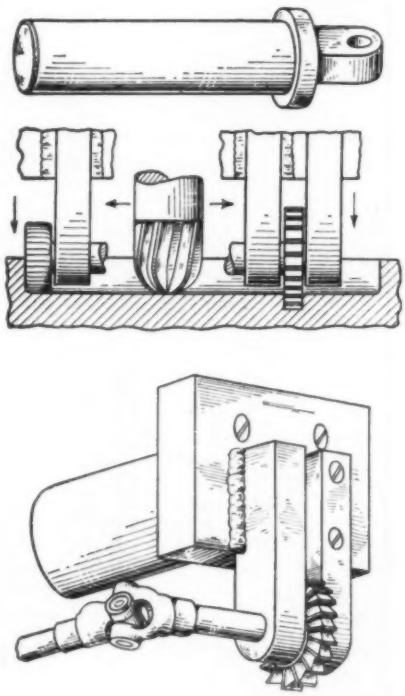
Collet-like construction of the vise fixture accommodates parts of varying diameters, and the rubber pad equalizes the clamping pressure on the pieces

Arbor Bracket Adapts Milling Machine for Die Sinking

ROSS A. SCHULTZ
Noblet & Forrest, South Australia

The analysis of the problem of sinking a pair of dies for forging a flanged pin indicated that it would be quite difficult to get into the semicircular grooves for finishing the ends of the recess and also to sink the flange groove because of the awkward cutter drive involved. Not having a die-sinking machine, and not being able to get one, it was decided to develop tools from materials at hand to perform the work in a milling machine using external power for the cutter drive. A bracket was secured to the milling machine vertical attachment to guide and support a cutter of the same diameter as the finished flange groove, whose drive was obtained through a stub shaft, universal joint, extension shaft, universal joint, and another short shaft chucked in a portable electric drill. If available, a standard flexible-shaft machine would be readily adaptable to this work with equally good results. As shown in the illustration, one of the bracket arms was welded in place while the other was purposely made adjustable to take different sizes of cutters, and in the next operation, slight changes were made in the setup. For the finishing and rounding of the end of the die, a formed radius end mill was employed. The illustration shows it supported by only one arm, which would probably be sufficient. Actually, the adjustable bracket was moved over close to the fixed one, to take advantage of the additional support. In order to provide clearance for the driving arrangement, the first step was the roughing of the groove, performed with a ball-head cutter in the vertical attachment.

Although only one set of dies was required, this method easily saved its cost on the one job and since has demonstrated other uses.



Sinking the die block for forging the pin: at top—ball cutter roughs groove providing clearance for end mill and flanging cutter; at bottom —details of bracket and drive

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Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive, the Navy Board of Awards to Civil Employees and the War Department Civilian Awards Board. Readers may find these ideas useful in their work.

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Spring Lockwashers

An American Standard (B27.1-1944) sponsored by the Society of Automotive Engineers and the American Society of Mechanical Engineers

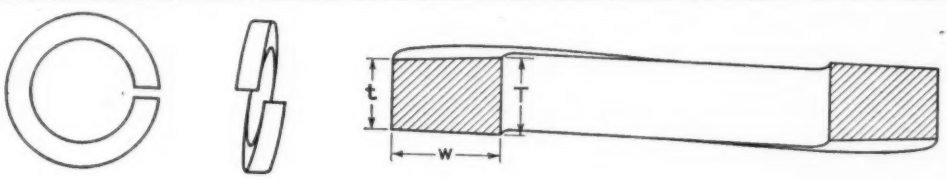
THE CARBON-STEEL lockwashers covered by this specification are intended for automotive and general industrial application. They have the dual function of: (1) spring take-up devices to compensate for developed looseness and the loss of tension between component parts of an assembly, and (2) hardened thrust bearings to facilitate assembly and disassembly of bolted fastenings by decreasing the frictional resistance between the bolted surface and the face of the bolt head or nut.

The section of the finished washers shall be slightly trapezoidal in shape with thickness at the inner periphery greater than thickness at the outer periphery by an amount varying from a minimum of 0.0005 in. to a maximum of 0.001 in. per 1/64 in. of section width. The minimum thickness specified in the accompanying table of dimensions represents the nominal mean thickness of the trapezoid. Reduced to formulas, the increase in thickness from the outer periphery to the inner periphery shall be $T-t=0.032W$ as a minimum, or $0.064W$ as a maximum.

Washers shall be coiled so that the free height is approximately twice the thickness of the washer section. Gap and relationship of severed ends shall be such as to prevent washers from tangling.

The flat faces of the washers and the inner and outer peripheries shall be smooth and free from knurling, serrations, die marks, and deep scratches, although slight feed-roll marks are permissible. Washers shall also be free of burrs, rust, pit marks and loose scale, and external circumferential edges shall be rounded sufficiently to avoid heat checks.

Washers shall be made of carbon steel, and fabricated and heat-treated to a Rockwell hardness of 47-53 C scale. Four series are standard: light, medium, heavy and extra heavy in sizes ranging from machine screw No. 2 to 1½ in. inside diameter.



Dimensions of Spring Washers

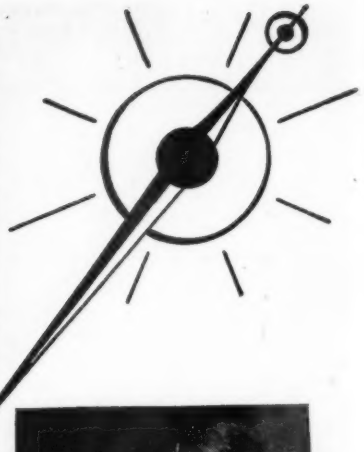
Nominal Size	Inside Diameter	Clearance of Nominal Bolt Size		Washer Sections (Minimum)								Outside Diameter Maximum*			
				Light		Medium		Heavy		Extra Heavy					
				Width	Thickness $\frac{T+t}{2}$	Width	Thickness $\frac{T+t}{2}$	Width	Thickness $\frac{T+t}{2}$	Width	Thickness $\frac{T+t}{2}$				
	Min	Min	Max	w		w		w		w		Light	Medium	Heavy	Extra Heavy
0.086 (No. 2)	0.088	0.002	0.011	0.030	0.015	0.035	0.020	0.040	0.025	0.053	0.027	0.165	0.175	0.185	0.211
0.099 (No. 3)	0.102	0.002	0.011	0.035	0.020	0.040	0.025	0.047	0.031	0.062	0.034	0.188	0.198	0.212	0.242
0.112 (No. 4)	0.115	0.003	0.012	0.035	0.020	0.040	0.025	0.047	0.031	0.062	0.034	0.202	0.212	0.226	0.256
0.125 (No. 5)	0.128	0.003	0.012	0.040	0.025	0.047	0.031	0.055	0.040	0.079	0.045	0.225	0.239	0.255	0.303
0.138 (No. 6)	0.141	0.003	0.013	0.040	0.025	0.047	0.031	0.055	0.040	0.079	0.043	0.237	0.251	0.267	0.315
0.164 (No. 8)	0.168	0.004	0.014	0.047	0.031	0.055	0.040	0.062	0.047	0.096	0.057	0.280	0.296	0.310	0.378
0.190 (No. 10)	0.194	0.004	0.015	0.055	0.040	0.062	0.047	0.070	0.056	0.112	0.068	0.323	0.337	0.353	0.437
0.216 (No. 12)	0.221	0.005	0.016	0.062	0.047	0.070	0.056	0.077	0.063	0.130	0.080	0.364	0.380	0.394	0.500
¼	0.255	0.005	0.017	0.107	0.047	0.109	0.062	0.110	0.077	0.132	0.084	0.489	0.493	0.495	0.539
5/16	0.319	0.006	0.020	0.117	0.056	0.125	0.078	0.130	0.097	0.143	0.108	0.575	0.591	0.601	0.627
3/8	0.382	0.007	0.023	0.136	0.070	0.141	0.094	0.145	0.115	0.170	0.123	0.678	0.688	0.696	0.746
7/16	0.446	0.008	0.026	0.154	0.085	0.156	0.109	0.160	0.133	0.186	0.143	0.780	0.784	0.792	0.844
½	0.509	0.009	0.029	0.170	0.099	0.171	0.125	0.176	0.151	0.204	0.162	0.877	0.879	0.889	0.945
9/16	0.573	0.010	0.032	0.186	0.113	0.188	0.141	0.193	0.170	0.223	0.182	0.975	0.979	0.989	1.049
5/8	0.636	0.011	0.035	0.201	0.126	0.203	0.156	0.210	0.189	0.242	0.202	1.082	1.086	1.100	1.164
11/16	0.700	0.012	0.038	0.216	0.138	0.219	0.172	0.227	0.207	0.260	0.221	1.178	1.184	1.200	1.266
¾	0.763	0.013	0.041	0.233	0.153	0.234	0.188	0.244	0.226	0.279	0.241	1.277	1.279	1.299	1.369
13/16	0.827	0.014	0.044	0.249	0.168	0.250	0.203	0.262	0.246	0.298	0.261	1.375	1.377	1.401	1.473
7/8	0.890	0.015	0.047	0.264	0.179	0.266	0.219	0.281	0.266	0.322	0.285	1.470	1.474	1.504	1.586
15/16	0.954	0.016	0.050	0.277	0.191	0.281	0.234	0.298	0.284	0.345	0.308	1.562	1.570	1.604	1.698
1	1.017	0.017	0.053	0.289	0.202	0.297	0.250	0.319	0.306	0.366	0.330	1.656	1.672	1.716	1.810
1 1/16	1.081	0.018	0.056	0.301	0.213	0.312	0.266	0.338	0.326	0.389	0.352	1.746	1.768	1.820	1.922
1 1/8	1.144	0.019	0.059	0.314	0.224	0.328	0.281	0.356	0.345	0.411	0.375	1.837	1.865	1.921	2.031
1 3/16	1.208	0.020	0.062	0.324	0.234	0.344	0.297	0.373	0.364	0.431	0.396	1.923	1.963	2.021	2.137
1 ¼	1.271	0.021	0.065	0.336	0.244	0.359	0.312	0.393	0.384	0.452	0.417	2.012	2.058	2.126	2.244
1 5/16	1.335	0.022	0.068	0.346	0.254	0.375	0.328	0.410	0.403	0.472	0.438	2.098	2.156	2.226	2.350
1 3/8	1.398	0.023	0.071	0.356	0.264	0.391	0.344	0.427	0.422	0.491	0.458	2.183	2.253	2.325	2.453
1 7/16	1.462	0.024	0.074	0.366	0.273	0.406	0.359	0.442	0.440	0.509	0.478	2.269	2.349	2.421	2.555
1 ½	1.525	0.025	0.077	0.375	0.282	0.422	0.375	0.458	0.458	0.526	0.496	2.352	2.446	2.518	2.654

All dimensions are given in inches.

For increased thickness due to taper, see paragraph covering washer section.

* The maximum outside diameters specified allow for the commercial tolerances on cold drawn wire and hot rolled rod.

STARRETT TOOLS



Wherever Dial Indicators Are Indicated
Make 'Em **STARRETTS**

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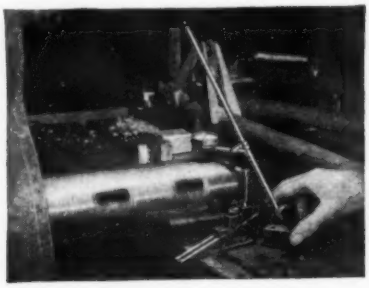

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Repair of Magnesium Parts By Gas Welding

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EMERGENCY REPAIRS on magnesium parts that have been broken or cracked can usually be made by gas welding. Generally speaking, such repairs should be considered a temporary measure until a replacement part can be obtained. And deviations from normal practice may be required in order to put the parts back in service quickly. Examples of such deviations are: use of multiple beads; the welding of sections that are impossible to clean thoroughly; the welding of cast metal.

An ordinary oxyacetylene welding torch can be used. Heavy sections sometimes require larger tip orifices than specified in Table I.

Use magnesium alloy welding rod of the same composition as the alloy being welded. If rod of the same composition is not available, a rod of slightly lower melting point can be substituted. Strips cut from sheet, extrusions or castings may be used, after thorough cleaning, as a welding rod if standard rods are not available.

A welding flux should be used—Dow 450 or 460—to prevent oxidation. Dow fluxes are supplied as powder, which is prepared by mixing two parts with one part water. Keep the bottle closed when not in use. Make up flux paste in a glass container to avoid contamination. If the above fluxes are not available, satisfactory repair welds can be made with most aluminum welding fluxes.

Welders working with magnesium alloys should wear gloves and the usual type of welding goggles. Blue glass gives best visibility.

The first step in making a repair is to clean the casting with alkaline cleaners, carbon tetrachloride, gasoline or soap and water in order to remove grease, oil, dirt, chemical coatings, or paint as the case may be. Dress the edges of the hole, crack or other defect to clean sound metal, sloping the sides to about 45 deg. If a defect penetrates the casting wall, a land or root face of about 1/16 in. should be left on the bottom side. Apply the flux paste with a small brush to the edges of the area to be welded. The flame should be adjusted to a ¼ in. inner cone, or until the inner cone slightly feathers at the tip when the oxygen pressure is lowered.

Preheat the casting to 650 F. before welding is started. A mark made with blue carpenter's chalk will turn white when a temperature of approximately 600 F. is reached. Actual welding is started by slowly preheating a small area with a fanning action of the welding flames. As the metal begins to melt, the welding rod is dipped into the molten puddle and then withdrawn as sufficient molten metal is obtained. The rod is held in the outer flame and is dipped intermittently into the puddle, the torch being moved forward as rapidly as possible. Incline the torch 45 deg. to the work and move it in a straight line. All welds should be made in one continuous pass if possible. After welding the casting should be placed in a furnace for one hour at 650 F. If no furnace is available, play a gas flame over the entire casting to bring it up to a temperature of about 650 F., after which the casting should be allowed to cool slowly away from drafts. When the casting is cool enough to handle with the bare hands, all excess flux is to be removed by thorough scrubbing with a stiff bristle brush and hot water.

When magnesium fittings or castings are gas welded to sheet or extrusions, edges of heavy cast sections should be beveled to the thickness of the sheet or extrusion, and the latter should be dressed down if more than 1/8 in. thick. The casting should be thoroughly preheated with a torch or in a furnace to 650 F. before welding.

Gas welds should be cleaned immediately with a stiff bristle brush and plenty of hot water. Next if the materials are available, the parts should be immersed for one minute in a solution consisting of 1½ pints of nitric acid and 1½ lb. of sodium dichromate plus water to make one gallon. After rinsing and drying, parts should be painted. If the solution is not available, emergency repair jobs should be scrubbed, rinsed, dried and painted for protection.

TABLE I—GUIDE TO SELECTION AND REGULATION OF OXYACETYLENE WELDING EQUIPMENT

Metal Thickness In.	Welding Rod Diameter In.	Tip Orifice Diameter In.	Tip Orifice Diameter Drill No.	Oxygen Pressure Lb./sq. in.	Acetylene Pressure Lb./sq. in.
0.020	1/16-3/32	0.035	65	1 to 4	1 to 3
0.032	1/16-3/32	0.035	65	3 to 5	1 to 3
0.040	3/32-1/8	0.035	65	3 to 5	1 to 3
0.051	3/32-1/8	0.035	65	3 to 5	1 to 3
0.064	3/32-1/8	0.040	60	3 to 5	3 to 5
0.072	3/32-1/8	0.040	60	3 to 5	3 to 5
0.081	3/32-1/8	0.046	56	3 to 5	3 to 5
0.091	1/8-5/32	0.046	56	3 to 5	3 to 5
0.128	1/8-3/32	0.059	53	3 to 5	3 to 5

TABLE II—MAGNESIUM ALLOY WELDING ROD*

Dowmetal Alloy	Melting Point, F.	Color dentification
C	1110	Yellow and Red
FS-1	1160	Blue and Green
H	1135	Green and Black
J-1	1145	Yellow and. Green
M	1200	Yellow
O-1	1130	Green and Purple

**Rod Diameters: 1/16, 3/32, 1/8, 5/32, 3/16 and 1/4 in.*

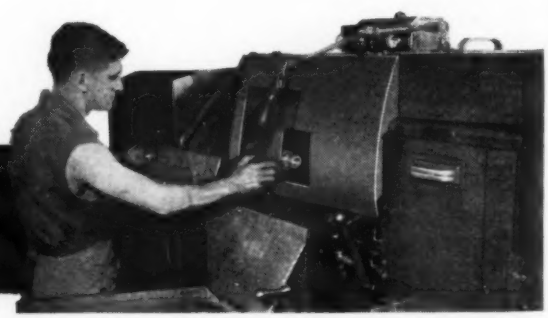
CHUCKING MACHINE EFFICIENCY 89.6%

Each time the ticking sound of a watch movement is heard, important phases of life begin and end. Whether it be in the form of a service-man's watch or in the delicately assembled timing device of an anti-aircraft shell, time must be accurate and dependable. Making good time for the past eighty-eight years, the U. S. Time Corporation of Waterbury, Connecticut, has devoted their entire experience and effort since Pearl Harbor supplying precision-built instruments of war.

The clockwork in the fuse body of an ack-ack shell governs the instant of explosion. A flaw in the manufacturing of this timing device or the brass fuse body in which it rests could result in a major catastrophe. To assure perfection, the first and second operation on the fuse body has been produced for the past three years on a battery of Model 656 New Britain Multiple Spindle Automatic Chuckers. The leaded brass forgings are machined at the rate of 237 fuse bodies per hour per machine, with carbide tip tool life running 2500 to 3000 pieces per grind. This machine performance, coupled with competent personnel and an organized inspection requiring 36 gauging operations, has made it possible to achieve the unheard of machine efficiency of 89.6% . . . This story is but one of the many New Britain case histories of the present war effort . . . superior productivity that can automatically be the tip-off to your winning peacetime manufacturing battles . . . quickly and economically. Consult with our Sales-Engineer in your area or, should you prefer, communicate direct.

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
New Britain-Gridley Machine Division



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Gaging Business

Reconversion Pattern Changed

Labor troubles have slowed down industry's reconversion plans to the point where steel plants report that pressure for deliveries has eased. Although assembly lines at Ford were the only ones actually halted by indirect labor trouble, the fact is that various suppliers of automakers had operations halted, all of which reduced the actual usage of steel below levels earlier planned. But this easing of delivery pressure is not doing the steel industry much good, because its operations have been hit by strikes and output has dropped.

It seems that the steel industry is now in a more vulnerable position with respect to labor difficulties than the auto industry was recently. Lack of coal, as a result of strikes at soft coal mines, has already cost a good amount of steel production, but may drop the industry's operations by as much as 25 percent. This would hit reconversion plans harder than any of industry's labor troubles thus far. Reduced steel deliveries would curb the fabrication of many consumers products at the plants of thousands of fabricators.

Aside from the coal situation, the steel industry is faced with demands for higher wages by its mill employees. The outcome is subject to negotiation, but discussions are hampered by the fact that OPA has held up price increases for the industry pending wage increases. Industry executives would have preferred things the other way around. As it is, they have been unable to reduce the work-week down to 40 hours, due to worker slowdowns and lack of new labor.

Tool Builders Unaffected

Despite the spreading labor difficulties, tool builders have not received any cancellations to speak of due to this factor. Tool buyers are still anxiously seeking deliveries during the current quarter, or early in 1946 at the latest. Although tool builders have about five-months' backlog in unfilled orders on an over-all basis, some individual companies have open order books for the next few months.

The industry is still trying to do its best to meet reconversion order delivery dates and handle the increasing volume of foreign inquiries and orders coming into the market. Labor difficulties may permit deferred deliveries in some cases, while plant clearance delays may force such deferrals in others.

Foreign Order Aspect

Dismemberment of the Foreign Economic Administration so soon after the ending of lend-lease, has temporarily held up clarification of the status of former lend-lease orders. Under section 3-c of the Lend-lease Act, provisions for foreign cash purchases are outlined. However, negotiations are apparently going on between the United States and Russia, France, and Belgium on new terms for purchases outside the Lend-lease Act

The Russians, who had been trying to secure price reductions, long term credits, low interest rates, and many other unusual terms from U.S. tool builders, are reported to have approached Canadian producers with the same terms, but with little success. Russia has a large amount of unfilled orders originally placed with Canadian tool builders under Mutual Aid, the Dominion equivalent of lend-lease.

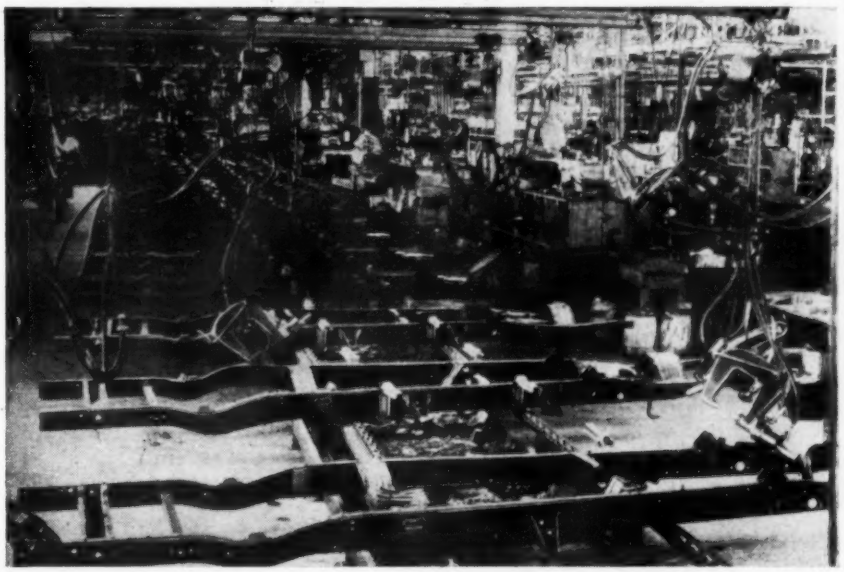
Jugoslavian agents are seeking inexpensive tools for use in repairing and maintenance of that nation's motor vehicles. Chinese representatives in this country talk of a $2,000,000,000 industrialization program, which might involve over $40,000,000 in American machine tool purchases over the next three years. Indian agents complain that dollar exchange allotments made to them by London are inadequate to permit them to buy here the full amount of industrial equipment they need. Moreover, active inquiries have been received from the Near East, South Africa, and Latin America. Early deliveries and easy terms are usually sought.

Surplus Tools Growing

RFC, agent of the Surplus Property Administration in disposal of surplus machine tools, faces one of the most difficult problems of plant clearance between now and the end of the year. Need for hundreds of thousands of government-owned tools in contractors plants for war work ended in mid-August, and plants must be cleared within 60 days of the contractor's request to the government. Thus far, few requests for plant clearance have been delayed over 60 days, but the picture is expected to be radically different by the end of the year.

Because this surplus volume will take extra selling effort, it is expected that RFC will enlist dealers in their disposal efforts. This is already being done by the British government in disposing of tool surpluses.

Recent reports that RFC would suspend the sale of screw machines and turret lathes, presumably because of oversupply, has no foundation in fact, say spokesmen for the organization.



Strikes Halt Civilian Production—This view of the standstill of the assembly line at Chrysler's Dodge truck factory is indicative of the broad set-backs industry received as strikes interrupted reconversion production plans. Truck frames are shown on the stopped assembly line, because pickets kept 800 employees from their work

Surplus Officials Considering Tool Dealers As Distribution Agents

WASHINGTON — Distribution of surplus machine tools by manufacturers and dealers is being considered by the Surplus Property Administration. It is understood the proposal was made by persons in the industry, through the Office of War Mobilization and Reconversion, which controls over-all reconversion policy.

Distribution through industry channels was brought up during the war, but during recent weeks the matter has been given rather serious attention by SPA, which makes surplus disposal policy, and by RFC, which handles the sale of industrial equipment, including machining tools. SPA will make the final decision.

Protecting Taxpayer

Responsible officials are trying to determine to their own satisfaction whether the distribution channels proposed are normally used in peace time, or whether some of the agencies who want to handle the tools are taking advantage of the great war surplus and the urgent demand. Government officials, who did not want to be quoted as yet, said they must consider the interests of the taxpayers as well as those of the industry.

Inasmuch as demand exists for all general purpose tools as released, it is not easy for SPA to justify commissions to dealers unless those dealers can show conclusively that they have been squeezed out of business because the government has become a supplier. They said that the government, as supplier, should try to use the same trade channels as were used by the manufacturers —if it uses any.

Four Dealer Types

Officials of SPA and RFC have been informed that there are four classes of dealers in the machine tool industry: 1: builders, many of whom sell direct; 2: dealers in new equipment; 3: dealers in used equipment; and 4: re-builders. These officials want to know if regular operators are the same people who are asking for distribution rights, and if so, whether they are actually sustaining loss as a result of the SPB-RFC program.

There is frequent mention of lobby tactics in Washington, and some sources expressed apprehension that Congress will yield and amend the law so that surplus will have to be distributed in the interests of traders, and against the public interest. They said they were thinking in terms of over-all surpluses, and not only tools.

Those favoring the dealer proposals cited the examples of cutting tools, aircraft parts, and electronic equipment, which were channeled through dealers by RFC. The plan admittedly is working out well in all three categories.

Some Opposition

But officials opposed to dealer distribution in general, however, said that in the case of cutting tools, it is the normal practice of manufacturers' representatives to assist customers in deciding what items they need. Electronics equipment is highly specialized, and the necessary final tests could be given only by the manufacturers. Pretty much the same is true of aircraft parts, they said.

One source, favoring dealer-manufacturer distribution of machine tools, said it was his rough estimate that about 60% of machine tools are normally distributed by agencies other than the manufacturers. He added that general purpose tools have not been declared surplus fast enough for the demand, but that in the special purpose class, dealers are necessary right now to find and sell customers. Later on, he contended, surplus disposal in the entire field will require salesmanship.

Discussions Going On

Dealer-manufacturer distribution was under discussion with Administrator W. Stuart Symington at this writing. It was a fair conclusion that the three-man surplus property board, which Symington succeeds, had not been able to agree on the proposal.

If the proposal is carried out, indications are that a customer can buy a tool either from a dealer, or from RFC, as he chooses, at the same price. Commissions to dealers will be paid by the Government.

Dealer distribution is in effect in England. Customers find most surplus listed in a pool at London. But if the customer states that his needs were located for him by a dealer, the dealer is paid a commission.

Strikes, Slowdowns Drop Steel Output; Demand Eases As Labor Hits Users

PITTSBURGH — Steel industry operations are going quite contrary to expectations some months ago, when observers foresaw near-capacity activity to meet record peacetime demand and predicted many bottlenecks. Since then, strikes have radically changed the picture.

Although demand is every bit as strong as had been expected, the strikes in the automobile industry have reduced the urgency of that demand, and reconversion delays have served to ease pressure for deliveries further. Thus, the inventory status of auto producers, with respect to flat-rolled especially, is much better.

Coal Strike Effects

Meanwhile, steel operations have been reduced due to coal shortages arising out of strikes of supervisors at the mines. What is even worse, the industry is being hampered on its usual Fall accumulation of coal reserves to tide it over the winter months, when inclement weather frequently delays deliveries. Unless we have a mild winter, this factor may upset steel operations for several months to come.

Other operational difficulties for the industry stem from the "slowdown" being indulged in by mill workers in order to delay the attempts of the mills to eliminate overtime and get back to a 40-hour week. This factor and manpower shortages have prevented the mills from cutting costs by eliminating overtime.

Wage Rise Imminent

With steel operations down and overtime continuing, the industry's profits are being further hit, especially since price relief has not been forthcoming from OPA. Despite this, steel mill workers have demanded a wage increase, and observers believe that they will eventually get a 15 percent rise. Labor-management negotiations are under way.

This may bring about some action on steel price increases, and this fear was what caused consumers to order heavily on a wide assortment of products. Structural steel demand is increasing, and the wave of buying in rail for 1946 has gotten off to a good start.

Aluminum Competition

The light flat rolled mills are still grappling with an extended backlog of orders. In this group is a particularly heavy volume of galvanized sheet business, which will occupy mills well into next year. One of the interesting sidelights of this volume is that the aluminum producers have set their sights on capturing a large volume of the roofing and siding business in rural areas, which is one of the principal outlets for galvanized sheets.

A. S. M. E. Discusses Metal Cutting At Fall Meeting in Cincinnati

CINCINNATI—Planned originally as a local gathering, the fall meeting of the Cincinnati Section, American Society of Mechanical Engineers, attracted so much interest that its sessions were attended by scores of out-of-town visitors. This was made possible by the easing of travel restrictions. The meeting was held at the Hotel Netherland Plaza, October 2 and 3; the program, arranged by M. E. Martellotti, chairman of the Cincinnati Section, put special emphasis on metal cutting.

Alex D. Bailey, A.S.M.E. president, addressed a dinner meeting on the engineers' contribution to winning the war, especially the activities of the Society in placing the combined and individual efforts of its members at the service of the government. At another session, D. R. Shoults, vice-president, Bell Aircraft Corporation, spoke on the airplanes of the future. He traced the development of jet propulsion and explained its possibilities for postwar use. He also described the helicopter and its role in feeding the larger air fields.

Centerless Grinding Talk

The first of the metal-cutting sessions was addressed by Albert H. Dall, assistant research director, Cincinnati Milling Machine Co., on the subject of the rounding effect in centerless grinding. Mr. Dall pointed out that a number of geometric shapes have uniform diameters without being round. He showed that the height and angularity of the work support has a critical influence on the trueness of the workpiece.

W. H. Oldacre, general manager, D. A. Stuart Oil Co., in a talk on cutting fluids deplored the absence of an engineering approach to the subject in most industrial plants. Most so-called studies, he pointed out, failed to get the basic data straight and consequently were of little value. He described pressure tests on various lubricants.

Carbide Milling Aspects

A symposium on carbide milling included three papers covering different phases of this subject. O. W. Boston, professor, and W. W. Gilbert, associate professor, University of Michigan, in a joint presentation told of their experiments on the face milling of cast iron. The second paper by A. O. Schmidt, Kearney & Trecker Corp., gave data on production runs with carbide milling cutters which supplemented this author's previous report. A third paper by Hans Ernst, research director, Cincinnati Milling Machine Co., and Michael Field, research fellow, University of Cincinnati, considered the economic factors in the selection of speeds and feeds used in carbide milling. Their findings indicated that some of the phenomenal speeds reported in the past should be reduced somewhat to afford the best combination of cutter life, machining quality and production cost.

Joseph M. Allen, Warner & Swasey Co., described the special equipment he had set up for single-point turning research. In the course of his talk, Mr. Allen pointed out the necessity of considering a rather narrow phase of the subject because of the millions of possible combinations of cutter shapes, cutter materials, cutter treatment and the materials cut.

Nomographs for analysis of metal-cutting processes were described jointly by M. E. Merchant, physicist,

Fred W. Lucht

Hans Ernst

and Norman Zlatin, research engineer, Cincinnati Milling Machine Co. These men presented a series of alignment charts which solved the complicated formulas pertaining to metal-cutting in graphical form.

Work Positioning

Fred W. Lucht, development engineer, Carboloy Co., described the effect of work positioning when face milling steels. His findings had to do with the angle of approach of the cutter tools in machining a steel block in various positions relative to the center line of the cutter.

Dr. Max Kronenberg, research engineer, The Cincinnati Milling Machine Co., gave an analysis of the initial contact on the milling cutter and discussed a graphical method for tool engineers to determine the magnitude of the high-speed impact. Applications of carbide-tipped tools from the user's viewpoint were discussed by M. E. Feldstein, general superintendent, Indirect Manufacturing Dept., Delco Products Co.

Selection of Plastics

The subject of plastics and their selection was covered in two papers by R. N. Backshieder, Recto Molded Products, Inc., and George H. Clark, vice-president, Formica Co.

Those in attendance at the Cincinnati meeting were given the opportunity of making plant visits to the Cincinnati Machine Co., Formica Insulation Co. and the Columbia Power Station. They also visited the Herman Schneider Foundation, organized to aid in cooperative education. Following a tour of inspection of the Foundation, a symposium on cooperative courses was addressed by Clyde W. Park, professor of English, University of Cincinnati, John Faig, Ohio Mechanics Institute, and W. W. Tangeman, vice-president, Cincinnati Milling Machine Co.

Gasoline Tank Truck Bodies Being Produced—Speedy reconversion by the Butler Manufacturing Company, Kansas City, Mo., is making possible the production of gasoline tank truck bodies, keeping employees on the job

Air Group Changes Name

WASHINGTON—The Aeronautical Chamber of Commerce of America, Inc., has changed its name to Aircraft Industries Association of America, Inc., retaining its former address at 610 Shoreham Building, Washington 5, D. C.

Detroit Letter

No Big Three Strikes

It is a safe bet that there will be no authorized strikes against any one of the Big Three in the automotive industry this year. The United Automobile Workers believe that the key to future wage rates will be found in agreements with General Motors, Ford or Chrysler. Whatever rates are thus established will become the pattern for the industry. Hence the U.A.W. is not interested in striking suppliers' plants and is doing all it can to prevent unauthorized strikes therein. Such wildcat strikes interfere with the plan for concentrating on the big fellows. Probably many weeks will be consumed in negotiations between General Motors and the U.A.W. and between Chrysler and the U.A.W. before either an agreement is reached or a strike is called.

If the U.A.W. strikes one of the Big Three, the plan is to do it in late winter or early spring, when production is high and a stoppage will hurt most. When asked whether a strike would be called soon, a union spokesman said, "Give us credit for being smarter than that."

Reconversion Proceeding

Reconversion progress in the automotive industry has not been paralyzed by strikes, as one might conclude from reading newspaper reports. General Motors divisions are doing very well, and Chrysler has been reconverting quietly but steadily. The general impression is that Chrysler has seriously lagged behind the others. It intends to erase that impression.

New Model Plants

The automotive industry's future plans line up as follows: fall introductions will be resumed, with 1947 models being put into production in the fall of '46 and embodying practically no major mechanical changes. The first important changes will be incorporated in 1948 models that will appear on the market in the fall of 1947. The nearly two-year time-cycle between design and development of new models and their public introduction prevents much radical change in '47 models. Purchases of plant equipment and machinery for 1947 car models will be made early in 1946 for delivery and installation by July and August. Considerable buying will be done for cost-saving and for the speeding of production entirely apart from machinery needed for mechanical changes in cars.

New GM Tool Plan

General Motors and Chrysler have modified their postwar programs for purchases of new machine tools. General Motors originally intended to buy 29,000 machines, 20,000 new and 9,000 from the government surpluses in its own factories. It is purchasing instead only 5,000 government machines and will order considerably less than 20,000 new machines. The sudden end of the war, with many machines not having been operated as long and as roughly as the corporation had anticipated, is one of the reasons for the reduced program. Chrysler is reported to have bought some 3,000 government surplus machines in its plants.

General Motors is understood to have a three-phase production program. The first phase is to produce cars at one-half the 1941 rate by the end of this year, the second phase is to be geared up for production at the full 1941 rate by next spring, and the third is to have ready facilities for the corporation's share of a six-million-car year by late summer of 1946.

In anticipation of a lush automotive market, Chrysler has been enlarging considerably the productive capacity of several plants, including Plymouth, Jefferson and Kercheval, all of which are in Detroit.

Industry In Low Gear

Little optimism can be found in the troubled skies hanging over industrial Detroit. True, the big Kelsey-Hayes strike, which shut down the Ford plant and all its far-flung branches, is settled and Rouge is turning out cars again.

But far and wide, little can be found to indicate that the automotive industry is ready to go into high gear on production. If the obstacle isn't strikes within the car manufacturers' own plants, it is the tieups of suppliers' plants which slow or even shut the main producers.

Production Trickles

Some of the companies continue with announcements of new models but production is merely a trickle. Buick and Pontiac both showed their lines in the past few weeks but it means little.

Both divisions of General Motors are handicapped by lack of bodies and by the continuing labor troubles in the Packard Electric plant which supplies them with wiring. The shiny new models sitting in the lobby of the General Motors Building are attracting hordes of prospective buyers but two of their questions go unanswered: How much will they cost? When can we get delivery?

Union On the Spot

Within the UAW-CIO, a grim fight is going on. Pressured by locals, the international officers are taking steps which they do not consider wise nor expedient at this time. They would rather postpone the showdown for a more opportune moment.

Even top labor is split on policy. R. J. Thomas, head of the UAW and a better diplomat than he is given credit for being, would delay strike action and effect a compromise on

1946 Buick Four-door Sedan—The new Series 50 Buick sedan is mounted on a 124-inch wheelbase chassis. Its improved design features full airflow fenders, new theft-proof rear wheel shields, completely restyled radiator grille and bumper assembly

peacetime wages for now. Walter J. Reuther, head of the General Motors division of the union, driven by ambition to replace Thomas and needled by the red-hots, is heading the faction spoiling for a fight now and the full 30 percent increase.

That the internal fight in the leadership is having its effect on the rank and file is apparent in the recent Kelsey-Hayes trouble. Ordered back to work by the international, the strikers continued to picket until halted by a court injunction.

Kaiser-Frazer Moves In

Meanwhile, the Kaiser-Frazer interests are preparing to move into the Willow Run plant. Moving day was set as October 15. The little machinery from the Graham-Paige plant will be moved over and then the new machine tools will start coming in, presumably from Cleveland. Jack and Heintz are supposed to be in on the deal.

Joseph Washington Frazer insists he will have a car ready for the market by Spring. This will be his Frazer car, once the 1946 Graham-Paige.

Designing has been completed and presumably, the dies and tools ordered, as well as materials. The rest of the industry is watchfully waiting to see just what happens.

Spare Parts Sales

The sale of spare parts appears to be a success here. W. P. Baughman, regional director in charge of the Detroit office of the Department of Commerce, has negotiated $20,000,000 worth direct to the original manufacturers. An equal amount has been sold to dealers, fleet owners, service garage and distributors.

The figures are the cost to the government and not what was received for them. The dollar value of the parts available will total nearly a billion when final inventories are received.

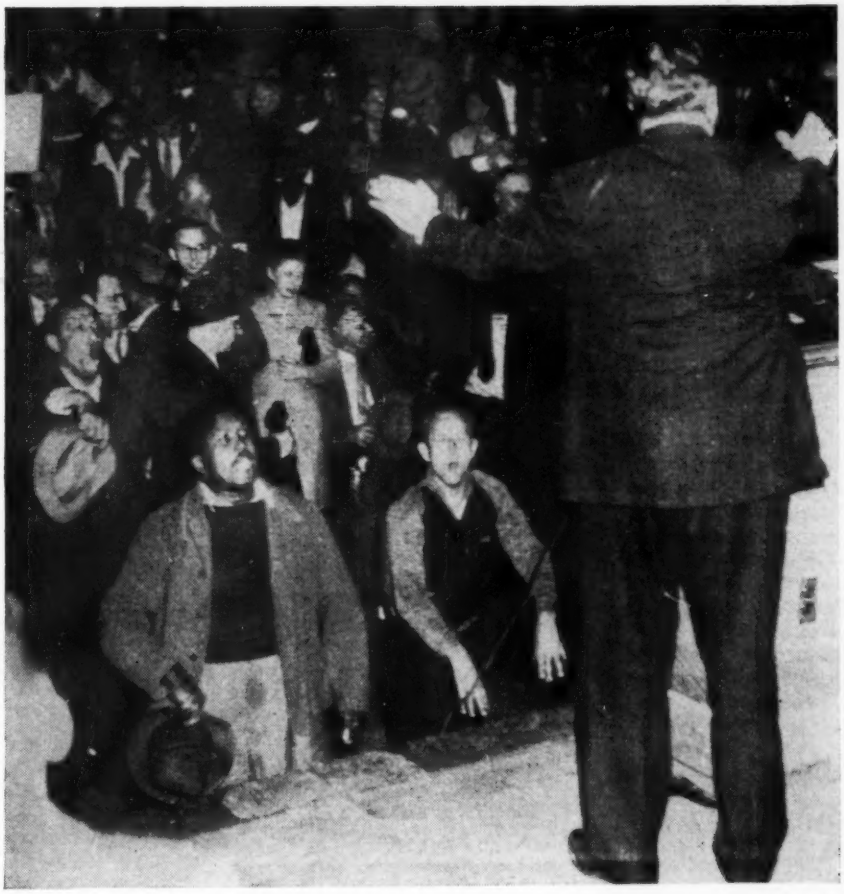
The selling of the parts back to manufacturers was a complete reversal of policy on the part of the government. At first manufacturers were barred from buying but so many protests arose that the bars were let down, resulting in quick disposal of many items.

New Buick Line

The 1946 line of Buicks, mentioned here before, show little change from the 1942 outwardly but under the hood there are many improvements. Buick claims it is using a new method of precision finishing the cylinder barrel walls.

After being precision bored, a new type hone is used on a surface finishing operation, leaving the bores conditioned to receive a lubrite coating. The coating is manganese phosphate treatment which provides rapid seating of the piston rings, together with protection from scuffing.

Aluminum pistons are again being used. Carburetor is dual downdraft type instead of the double, compound units. The intake manifold has been redesigned for the change.



Union Leader Defied by Strikers— Inability of union leaders to cope with unauthorized strikes by locals is dramatically illustrated here as Kelsey-Hayes Wheel workers boo and jeer United Auto Workers president, R. J. Thomas (a right), as he appeals to the men to go back to work. The Kelsey-Hayes strike threw union members at Ford out of work

Prices Uncertain

No price tags are attached. Some companies have finally worked out their pricing formulae and have sent down a list to be approved by OPA. The latter won't give them out until the manufacturer announces, so the public will still be in the dark.

The mystery injected by the announcement that the first Chevrolet has come off in some dark corner of Kansas may be connected with the pricing muddle. Some observers believe that the division's silence on its new cars may presage a sudden announcement, coupled with definite prices, to outsmart competitors.

Chrysler is still mum on what it plans to do or when it will do it.

Frameless Car Possibilities Subject of SAE Discussion

DETROIT—At the S.A.E. Detroit Section meeting, Theodore Ulrich, chief body designer for Nash-Kelvinator and N. T. Dietrich of Miland Steel Products Co., presented papers that revealed both sides of the question of frameless cars. Wm. B. Stout, of Consolidated-Vultee Aircraft, now on loan for a special research project, to Graham-Paige, was the moderator and threw in some ideas of his own. Ulrich said that the Nash "600" frameless body had greater front end stiffness, all around stiffness increased 53 percent, thus resulting in 160 pounds saved in frame weight above.

Stout confirmed these ideas and called attention to gain in light weight of engine and running gear when body weight was reduced. This increased the overall performance and economy of the car. He predicted tubular framed bodies of aluminum designed and built more like an airplane with great strength and light weight. He intimated that rear engine cars would be forthcoming and provide greater safety.

Engineers Propose Five-Point Plan To Curb German War-making Power

NEW YORK—The National Engineers Committee has proposed a five-point program to prevent German rearmament by a strict control of that nation's industry, from raw materials to processing and scientific research. This plan would require effective controls on power production and distribution and industrial plant construction to: (1) prohibit the development or use of atomic energy; (2) prohibit the production of aluminum; (3) limit the capacities of steel mills and processing plants; (4) prohibit the synthetic fixation of nitrogen; and (5) prohibit the production of synthetic liquid fuels. It further proposes to eliminate secret scientific research by preventing coordinated efforts of German development facilities, and prohibiting economic subsidies to industry by the German government.

Backed by 35 Experts

The National Engineers Committee of the Engineers Joint Council was asked to make a study of control of Germany's war potential last February by the Council, with the approval of the State and War Departments. The report is based upon studies made by 35 leading engineers and technicians. The Executive Committee consists of: The American Society of Civil Engineers, Malcolm Pirnie, past president; American Institute of Mining and Metallurgical Engineers, Harvey S. Mudd, president; the American Society of Mechanical Engineers, Robert M. Gates, past president; American Institute of Electrical Engineers, Charles A. Powel, president; and American Institute of Chemical Engineers, Dr. Lawrence W. Bass, president. The National Engineers Committee consists of Robert E. McConnell, New York, chairman; Harry S. Rogers, vice-chairman, president of Brooklyn Polytechnic Institute; Thomas F. Barton, commercial vice-president, General Electric Company; Colonel Carlton S. Proctor, consulting engineer, New York; Dr. Edward R. Weidlein, director, Mellon Institute of Industrial Research, Pittsburgh; and Dr. Clyde E. Williams, director, Batelle Memorial Institute, Columbus, Ohio.

Best Control Sought

Holding that complete elimination of German industries would cause economic and social dislocation throughout Europe, the report is built around philosophy of removing from aggressor nations their industrial war potential. It is stressed that complete elimination of German industry is practically impossible, might be repudiated in a short time by world public opinion, thus laying the groundwork for the same aftermath that followed World War I. Instead, it is felt that the policies recommended would require minimum policing with adjustments from time to time as recommended by technical advisors.

These recommendations would only reduce peacetime employment by five percent, and this could be absorbed in agriculture and consumer goods production. Although method of control is left to the authorities in charge, the report details the factors which must be controlled: (a) energy allocation; (b) raw material elimination or limitation of critical war elements; (c) processing, fabrication and new construction; (d) scientific research; and (e) economic subsidies.

Since coal supplies 85 percent of Germany's power and light, besides providing the raw material base for certain war chemical industries, the report holds that coal use must be controlled.

To allow Germany aluminum only for peacetime uses, it is suggested that the manufacture of the metal from raw materials be eliminated and only a light fabricating industry be allowed. All alumina producing and smelting plants in Germany are to be either demolished or removed according to recommendations of the Reparations Commission. Imports of raw materials, aluminum, and scrap are to be controlled.

To Cut Steel Capacity

Germany's iron and steel capacity should be reduced to a level decided upon as being sufficient to meet domestic peacetime needs. Importation of iron, iron ore, alloys or alloying elements would be controlled. Future construction would be regulated to guard against large new plants that might be usable for limited or abolished purposes.

Tool Group Will Advise China on $2,000,000,000 Postwar Program

NEW YORK—About $2,000,000,000 worth of machinery, equipment and materials will be purchased in this country over the next three years by China for the rehabilitation and expansion of its industry, transportation and agriculture, according to a program outlined before a conference in New York of representatives of machine tool companies. The meeting on September 26th was called by the China-American Council of Commerce and Industry, and resulted in the setting up of an advisory committee of machine tool executives to confer with the official Chinese agencies here.

Alex Taub, Consulting Engineer for the reorganized Chinese Supply Commission in America, outlined China's machine tool needs for her initial reconstruction program. Such machine tool purchases are estimated at scores of millions of dollars. Mr. Taub pointed out that China is determined to industrialize so that it will be able to produce some of its own machinery and equipment needs.

China's initial reconstruction program will require plants to make: electrical equipment, telephone and telegraph equipment, radio equipment, batteries, medium and light machine tools, heavy machine tools and industrial equipment, hand tools, automotive equipment, pumps, engines, compressors, turbines, textile machinery, small agricultural implements, and railroad equipment. The 25 plants planned in these fields will require over $150,000,000 in imported machinery and construction materials over the next three years.

Mr. Taub said that it would be highly advantageous for tool builders to cooperate with Chinese technicians and executives now in this country, to help the Chinese determine the types of equipment needed and to cooperate in training Chinese mechanics and technicians.

Ralph E. Flanders, president, Jones & Lamson Machine Co., and a director of the China-America Council, emphasized the Chinese preference for American equipment and technical skill, but stated that the tool industry would be able to help China when that nation has definitely determined on the particular products and designs to be manufactured. Mr. Flanders is the head of the tool executives advisory committee, which will confer with Chinese representatives.

Major tool and equipment companies represented at the meeting included: Black & Decker, Black Rock Mfg. Co., Bullard, Cincinnati Milling Machine, Cone Automatic Machine, Consolidated Machine Tool, DoAll International, Ex-Cell-O, Fellows Gear Shaper, General Machinery, Jones & Lamson, R. K. LeBlond Machine Tool, Murchey Machine & Tool, National Acme, New Britain Machine Company, Republic Drill & Tool, Sundstrand Machine Tool, Warner & Swasey.

Washington Bulletin

New Wage Law

After years on the shelf, due to high war wages, the wage-hour law is back in the news. Main provisions of an amendment before Congress are that the base wage be increased from 40c to 65c within 120 days after signature by the President, to 70c the next year, and 75c the next. An industry committee could adopt a basic wage of 65c to 75c at any time after signature. The amendment would provide differentials for different occupations within an industry. Testimony shows that less than 10% of workers in machinery industries get less than 65c, and if the amendment were passed, as it probably will be, resulting increase in payrolls would be less than 1%.

Federal Research Groups

Persons interested in pending bills to create a national research organization should obtain the tabular summary of the eight proposed measures, compiled by the Aircraft Industries Association in Washington. Hearings are in progress. Scientists want the organization, but without the usual bureau administrators—they hope. Some sort of agency will be provided, no doubt, as a result of current enthusiasm for research. But it will disappoint most people who expect it to invent marvels. The National Advisory Committee for Aeronautics, in basic or "pure" science more than 25 years, has never invented a thing.

Keeping Atomic Secret

Present status of atomic energy in brief: The President has recommended to Congress (1) that international considerations be deferred for the present and that the lid stay tight on all U. S. atom secrets; (2) that Congress determine the principles under which commercial aspects shall be developed, and that a commission be appointed to acquire any privately owned lands yielding source ores. He urged Congress to maintain existing atomic bomb plants. Informed persons are speculating that the Army now has up to 100 bombs. Experts associated with the A-bomb project say there is no defense against it in sight.

Navy Proximity Fuse

Navy released the facts on its "proximity fuse," ranked second only to the atmoic bomb among wartime technical developments, so that industry could start adapting its possibilities. Basically, the fuse is a radio transmitter-radar set, no bigger than a pint bottle, installed in the nose of a shell. When the shell comes within effective distance of the target (airplane, ship, tank, ground, or water) radio emanations bounce back from target and detonate the charge. Tubes in the set are ⅝" by ⅛". Not only can very small radios be developed from this invention, but many applications for "proximity" relay control of industrial machinery and equipment may be found.

Aircraft Output Down

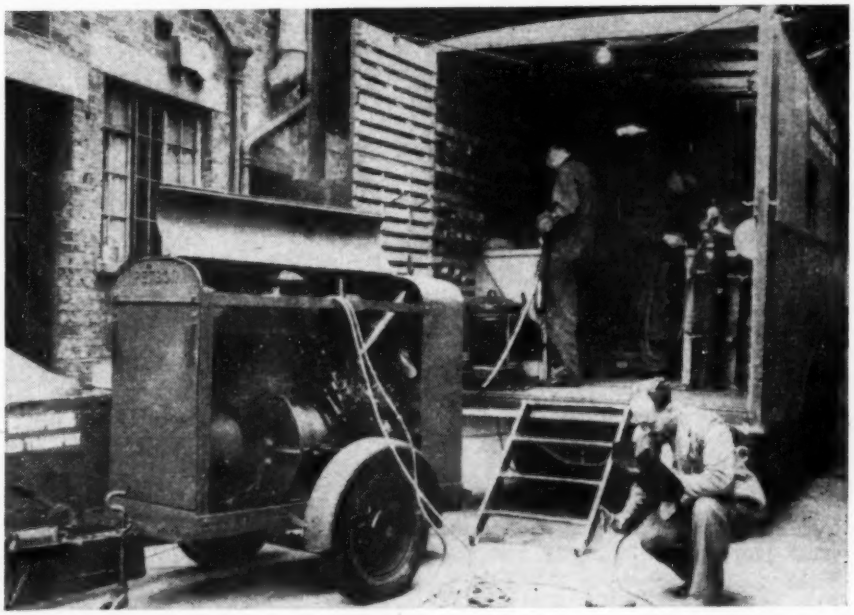
Aircraft production is already below the ten percent of wartime maximum predicted months ago. Army and Navy are calling for no more aircraft this year and next, than were produced in one month in midwar. Demand for air transport equipment is booming, but it will be small at best. Whether personal type airplanes of present design will sell in volume has yet to be determined. All aviation and allied development projects will continue at a high level indefinitely. Future military production depends entirely upon the findings of postwar military policy committees in Congress, which have before them a stupendous task in the determination of the relative value of future weapons, including airplanes.

Armed Forces Merger

Question of merging Army and Navy into a single department of defense, and of equality for the air forces, is up again and will stay up for a long time. House Postwar Military Policy Committee met October 15 to consider plans for further hearings. Best argument for status quo will be crushing defeats delivered the enemy by dual commands. Battleship admirals and walking generals are already playing aviation down, fearing they will lose control of it or even eventually become subordinate to it. Pro-air writers are accusing the Navy of planning more battleships than carriers, which took capital position during the war.

ALCOA Break-up

In its plans to dispose of 52 government-owned aluminum plants to build competion against the Aluminum Company of America, the surplus Property Administrator, the Department of Justice, and the Reconstruction Finance Corporation are backed by the Administration itself. SPA Administrator W. Stuart Symington's lengthy recommendation to the President and to Congress indicates clearly that he and his backers intend to subsidize newcomers in the aluminum field, with various aids and benefits, to break up ALCOA "domination."



Mobile Repair Vans for Europe's Immobilized Vehicles—Because lack of repairs have immobilized thousands of vehicles throughout Europe, mobile workshops, such as this, have been sent from Britain to Paris, Brussels and The Hague to demonstrate the servicing of damaged trucks and autos. Each mobile unit is equipped with grinding wheel, drilling machine, lathe, and accessory tools, an oxyacetylene welding plant, and the accompanying trailer has an arc-welding set with self-generating plant

Lifting of Canadian Preferential Duties May Aid U. S. Industry

MONTREAL—American auto makers might be considerably helped if preferential duties against U. S. cars and in favor of British cars are lifted, as one outcome of Anglo-American trade discussions in Washington. The reason is that at present there is a duty of 17½% on U. S. cars imported into Canada, whereas there is none on British cars. The U. S. tax might be lifted or the same or similar tariff applied to U. K. exportations.

Whether the reduction of Empire trade preference which the U. S. is reportedly asking in return for financial aid to Britain would be a blow to Canada's postwar trade has economic experts here worried. Three factors enter the picture, they say: (1) whether or not total abolition of preferences will be asked, and if not, to what extent Canada might be asked to give up present preferences; (2) what Canada might stand to receive in return for preference concessions, such as tariff reductions with other nations, etc; (3) what will happen to Canadian exports if nothing is done to improve world trade possibilities. It is felt that Britain in any case will be the biggest loser.

Scrapping Surplus Ships

Canada has a sizeable fleet of warships which will be sold soon for their scrap value. Thus far, relatively few have been sold. Sixteen Canadian corvettes were sold early in October to a steel firm at Hamilton, Ont., to be broken up as scrap. While the price at which the stripped ships were sold is not available, it is believed that it was under $10,000 each. The original value of the corvettes was one million dollars apiece. The ships were towed from Montreal to Hamilton by tugs. Practically all equipment had been removed and their hulls are now rusty and their trim superstructure bent.

Russian Negotiations

Having given American tool builders a sample of hard-headed business dealings, Russia is now trying to secure price reductions, low credit terms, and elimination of various internal taxes on equipment purchased in Canada. The amount of possible Russian business that may arise from these discussions has been set at anywhere from $50,000,000 annually down to $5,000,000 annually.

In any event, Russia seeks a 2¼ percent 30-year credit, and a 25-30 percent discount from Canadian sales prices. Canada has at stake some substantial Russian orders under Mutual Aid, which were held up at the end of the war. Negotiations are largely over the undelivered portion of such orders, even though the Russians are understood to be interested in securing foodstuffs from the Dominion, under terms that may be based upon agreements over equipment orders. Russia originally placed about $50,000,000 worth of industrial equipment orders in Canada under Mutual Aid, but now that it must pay for such orders it is complaining that prices are too high.

14 Nations Attend Meeting of International Standard Group

NEW YORK—Representatives of 14 United Nations met here from October 8th to 10th to take up further progress in the unification of international standards, originally started in connection with Allied war production. The meetings temporarily postponed decision on the language to be used at the conferences, when the British delegation opposed the possibility of French being adopted for the meetings. As a result of this, the United Nations Standards Coordinating Committee will receive communications in English, French, Chinese, Spanish, Portugese and Russian.

Discussion on the basic question of adopting either inches or millimeters as the postwar measuring standard for international purposes, was postponed until the next meeting in London, scheduled for sometime in the spring of 1946.

This was the first peacetime meeting of the group, and was attended by representatives of Australia, Belgium, Brazil, Canada, China, Czechoslovakia, Denmark, France, Great Britain, Mexico, Netherlands, New Zealand, South Africa and the United States. The United States was represented by Dr. H. S. Osborne of the American Telephone & Telegraph Company, with Dr. P. G. Agnew, secretary of the American Standards Association as alternate.

Auto Firms Plan Continuous Cylinder Block Machining

DETROIT — Studebaker, Olds and Buick have plans to machine their cylinder blocks very much in the same fashion that Wright airplane cylinder heads were during the war. In other words, the casting is mounted on a master plate that automatically progresses from machine to machine. On the big Wright Greenless, only three operators and three set up men were required. While this reduces the cost per price in man hours it introduces machine tool cost that can only be supported by high production.

Where the great difficulty lies now is getting labor and management together to use these time saving devices. Very frequently tooling men remark that they can double the present production with their improvements but the unions will not utilize the new equipment, slowing down so that there is no increase in output. They claim "speed-up" but usually there is no increase in physical effort required.

Present At United Nations Standards Meeting—Among the delegates attending the New York meetings of the United Nations Standards Committee from October 8-10, were (left to right): H. J. Wollner, secretary, UNSCC New York Office; P. G. Agnew, secretary, ASA; J. Morel, representing Belgium; Colonel H. Wang, representing China; and C. le Maistre, secretary, UNSCC London office

New Surplus Property Administrator Plans to Speed Up Surplus Sales

WASHINGTON—Upon assuming office, W. Stuart Symington, new Surplus Property Administrator, announced reorganization of the Surplus Property Administration to speed surplus disposal. Administration will be decentralized under five assistant administrators to speed up solution of pressing surplus problems, notably (a) simplifying veterans' preferences in buying surpluses; (b) expediting plant clearance; (c) taking care of preferred groups, such as Federal, State and local governments and small business, without delaying surplus disposal; (d) speedy disposal of war plants and equipment to help peacetime production.

Five Subdivisions

The new administrative branches and their chiefs are: Mr. David H. O'Brien, capital and producers goods; Mr. Merritt C. Penticoff, consumers goods; Colonel G. E. Monson, USMC, operations; Dr. Raymond T. Bowman, economic research; Lt. Col. John M. Redding, public information and policies.

To help speed up surplus sales, one of the last acts of the Surplus Property Board before its changeover to the new set-up was the issuance of a new regulation to set up reserves to take care of preferential buyers. Previously, surplus sales had been held up for thirty days in order to allow preferential buyers—federal agencies, states, municipalities, veterans and small businesses—first crack before commercial buyers were allowed to buy such items. The setting up of over-all reserves of surpluses considered to be adequate to meet the needs of the preferential groups will now make possible the prompt sales of newly available surpluses.

The other major obstacle to prompt sales, the provision for the broad advertising of surpluses for 30 days or so before they could be sold, was eliminated when SPB decided to launch broad advertising programs for each general group of commodities available for sale, thus obviating the necessity for holding up sales of newly available items.

Cleveland To Be Site of 27th Metal Show Week of February 4

CLEVELAND—The 27th National Metal Exposition will be held in Cleveland's Public Auditorium from Monday, February 4th, through Friday, February 8th, 1946, according to an announcement made by W. H. Eisenman, secretary of the American Society for Metals, sponsor of the event. Cooperating with ASM in presenting the show will be the American Welding Society, two divisions of the American Institute of Mining and Metallurgical Engineers, and the American Industrial Radium and X-Ray Society.

Mr. Eisenman pointed out that this will be the first show in four years at which exhibitors will be making an actual effort to sell their products. The Show was originally scheduled for October, but was moved back due to convention and travel restrictions. Exhibit space at the show is expected to be larger than that available at any similar event in history.

The national meeting of the American Welding Society will be held at the Hotel Cleveland here from February 4-7, while the annual convention of the American Society for Metals will be held at the Statler Hotel.

Mr. Eisenman, Managing Director of the Exposition, is located at American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio.

Read to Make Latin American Dealer Appointments for AMTEA

Fred M. Read

Fred M. Read, general manager of AMTEA Corp. left for an extended Latin American trip October 1st to launch AMTEA's program of dealer appointments. Since its organization in the spring of 1945 AMTEA has been building up its membership and laying the groundwork for its trade campaign, development of which hinges upon the forthcoming appointments by Mr. Read of an exclusive dealer for each country he visits. Appointed dealers will send men to the United States for basic training in the application and use of AMTEA's products in addition to placing qualified resident specialists in strategic locations in Latin America to collaborate with its dealers and users of machines. That it is necessary to develop a well integrated organization where a large potential machine tool market exists, is recognized. Included in AMTEA's present membership are leading manufacturers of practically all the basic types of machine tools found in machine shops.

Small Manufacturers Oppose U. S. Patent Law Revisions

GARY, IND.—Smaller manufacturers are planning a counter-offensive against widely publicized attacks on the U. S. Patent System, according to John W. Anderson, president, The Anderson Company. Mr. Anderson is leader of the movement, which has formed the new National Patent Council, as representative of smaller manufacturers in 28 industries.

Mr. Anderson said, "Although the vociferous critics of the Patent System profess to be saving the country from monopoly, they are in reality promoting monopoly by threatening the life of every smaller company relying upon patents." Pointing out that individual efforts of small companies have not accomplished much, he said that formation of the National Patent Council was effected to appeal directly to the public 'to get the misled 'reformers' off our necks so we can plan jobs and products for higher levels of good living."

According to Mr. Anderson, smaller manufacturers originate and produce most of the patented inventions upon which industry is based. He stated that as long as Congress and the courts hold inviolate the traditional 17-year exclusive right of the inventor to his own creation, small manufacturers can continue to invade the markets of competitors successfully.

While headquarters will be here, offices will be open in New York and on the Pacific Coast. Council policy will be determined by a board of five governors, made up of small manufacturers, and the board will be responsible to representative regional chairmen, also small businessmen. Some 200 leading patent lawyers have already volunteered their services on patent matters.

New Postwar Production

Four new plastics, suitable for tool-making, protective coating and aircraft parts, are announced by Duorite Plastic Industries, Culver City, Calif., under the trade names, Plastipaste, Plastipeel, Plastiform and Plastitool.

A new type portable electric washing machine is a postwar product just announced by Menasco Manufacturing Co., Burbank, Calif. The company will continue production of aircraft landing gear, aircraft engines and jacks.

Postwar items in or starting production at Adel Precision Products Corp., Burbank, Calif., include a 35 mm. camera, a Surgiscope which adapts the camera to hospital use, high quality, new design stainless steel kitchen utensils, a filling station pump for liquid propane and butane and the company's line of aircraft clips.

Jet Plus Conventional Engine In FR-1—This new Navy fighter combines jet propulsion with a conventional gasoline engine. The "Fireball" has a General Electric designed Thermal Jet engine in the tail of the fuselage, giving it the appearance of a conventional single-engine fighter. Made by Ryan, the planes were in production when peace came

Reconversion Council Organized By Industrial, Civic Leaders

LOS ANGELES—Fifty community leaders, representing leading industries, government agencies, labor organizations, civic organizations, newspapers, radio, and other walks of life, have organized a Citizens' Reconversion Council, under the sponsorship of the Los Angeles Chamber of Commerce, to tackle problems which point toward employment for released war plant workers.

Objectives immediately to be undertaken are: to locate job openings and assist industries offering the greatest opportunity for jobs; to relieve shortages of material and to locate surpluses wherever they may exist; to ease government restrictions that are holding up production wherever possible; to exchange information among plants on reconversion methods that have proved their utility; to enlist the services of community organizations, including trade groups, that greater cooperation may be secured for the program.

The chamber is asked to appropriate $10,000 from its current budget's reserve funds to get the program under way. To function along the lines of the Citizens' Manpower Committee of Los Angeles, which achieved national recognition as one of the most effective community efforts in the solution of wartime problems, the council will utilize the services of the chamber staff, including its Washington office. Maximum number of jobs provided in the shortest possible time in the reconversion of business and industry is the council's aim.

WPB Machinery Specialists Now Available to Industry

NEW YORK—Specialists in the machinery field who are serving the War Production Board are now available to private industry due to the termination of many of the board's activities. As a result of repeated contacts with many trades and businesses during their association with the board, it is felt that these men and women have gained the technique of cooperation between business and government, which should stand them in good stead with any firm, particularly during the reconversion period.

Employers desiring to interview machinery specialists can write to the Regional Director, War Production Board, Empire State Building, New York 1, N. Y.

Foremen Aid Reconversion

WICHITA, KANS.—During the reconversion at Beech Aircraft Corp. in Wichita, Kans, it has been necessary to assign many odd jobs to the staff. Many foremen are called upon to lend a helping hand in moving and loading machinery and fixtures used during the war.

"Not bad, not bad," is the way many of them put it. "It's different kind of work. It makes us feel as if we're helping to do a big job." One of the workers confided, "Kinda like when I was a kid and used to help Dad build the chicken house.

Several weeks ago, John P. Gaty, general manager, explained to the keymen of Beechcraft, when he said, "It may be necessary to assign you new duties during the transitional period and perhaps afterward as long as readjustments are going on—and if you are assigned the job of painting fence posts' I know you will do it quicker and better that it has ever done before. That is the Beechcraft spirit."

British Tool Control to Sell Tools Right at Plant

LONDON—To help clear plants of surplus tools, arrangements are being made by Machine Tool Control to sell tools direct from site at selected factories and stores. Each factory will have a sales depot with a self-contained organization to enable purchasers to inspect machines where they lie. The services of a dealer in the selection of machines may be utilized without extra cost, lists of approved merchants being available at each sales depot, as well as at the permanent disposal centres, and the dealer's commission will be paid by the government. The first of these special site sales started near Coventry on September 26.

Headed by J. B. Small, CPA Replaces WPB, Krug Resigns

WASHINGTON—The resignation of J. A. Krug, chairman of the War Production Board on November 3 will be coincident with the dissolution of WPB. Successor of the WPB will be the newly created Civilian Production Administration, headed by J. B. Small as administrator.

J. A. Krug

The CPA will take over and carry forward those remaining WPB functions and controls that will be required during the transitory period of reconversion. All powers, personnel, records, etc., are to be transferred, also, and will remain in effect until revoked or amended.

Special emphasis in the new bureau will be placed in five groups — industrial reconversion, operations, reconversion priorities, field operations, international supply and demobilization.

Names in the News

John S. Bugas

J. S. Bugas has been named head of the new industrial relations division of the Ford Motor Co. while other executives who will direct the peacetime operations of the firm include **H. H. Bennett,** who will serve in a consulting and advisory capacity and continue as a director, **M. L. Bricker,** who is in charge of manufacturing, and **R. R. Rausch,** who will work with Mr. Bricker on major construction projects.

Thomas J. Hilliard, general manager of sales for the past seven years, has been elected vice president in charge of sales of the Carnegie-Illinois Steel Corp. **J. Douglas Darby,** manager of sales for the company since 1939, has succeeded Mr. Hilliard as general manager of sales.

Raymond W. Young, chief engineer of Wright Aeronautical Corporation since 1940, has been appointed vice president in charge of engineering. He will be succeeded as chief engineer by **W. G. Lundquist,** who has been directing development of an aircraft gas turbine engine for Wright.

Guy J. Coffey, manager of the Los Angeles district office since 1939, has been appointed vice president in charge of sales of the Chicago Pneumatic Tool Company. Mr. Coffey has worked in various of the company's branch offices since joining the firm in 1933.

Ralph F. Peo, vice president and director of the Houdaille-Hershey Corp., recently resigned. He had also been manager of the corporation's subsidiary, the Houde Engineering Div., Buffalo, N. Y., with which he had been connected since 1927.

John A. Steubert was recently elected president of the K-D Lamp Company, Cincinnati, Ohio, to succeed **H. R. Kerans.**

Noel de Cordova, who has been with the firm since 1942, has been appointed to the newly-created post as sales manager of the Standard Gage Co. At the same time, **Alfred H. Emery** was appointed chief engineer. Mr. Emery, who has been with the firm for the past 20 years, will also be in charge of research.

John C. Smith, formerly manager of manufacturing at the Canton, Ohio Naval Ordnance Plant operated by Westinghouse Electric Corp., has been named works manager of the Westinghouse operated Naval Ordnance Plant at Center Line, Mich.

The Lincoln Electric Co., Cleveland, Ohio, recently appointed several welding engineers in their district offices. Included in the group are **John A. Smithers** in the Detroit area, **W. L. Herbst** at Chattanooga, Tenn., **Harold H. House** for the Moline, Ill., area, **C. M. Burnett** in Boston, Mass., and in Duluth, Minn., **L. B. Wallner** replaces **I. R. Bartter** who is now in the Grand Rapids, Mich., office.

William J. Chovanec, formerly a member of the engineering staff, has been appointed district sales manager of the Cincinnati territory for The Cleveland Automatic Machine Co.

Robert D. Pollock, vice president of Scott Aviation Corp., Lancaster, N. Y. has been placed in charge of manufacturing while **Howard A. Benzel,** another vice president, is in charge of engineering for the company.

Roy A. Bass, recently resigned district sales manager for the Ross Heater & Manufacturing Co., Buffalo, N. Y., has been appointed to the newly created position of director of distribution of Dresser Industries, Inc., Cleveland, Ohio.

W. S. O'Connor has been appointed national field sales manager to assist **L. L. Corcoran,** sales manager of the United States Guage Co. **H. M. Bear** will succeed Mr. O'Connor as district manager of the New York sales area.

Paul R. Cutter recently joined the staff of the Hanson-Van Winkle-Munning Co. as an electrochemist to work on special processes. Mr. Cutter was previously assistant chief chemist of Consolidated-Vultee Aircraft Corporation.

J. H. Edmonds, general manager of the Lebanon, Pa., plant of the Bethlehem Steel Company, retired on October 1. **Walter R. Penman,** formerly assistant general manager, succeeded Mr. Edmonds. Mr. Edmonds, general manager since 1928, has been with the company for almost 40 years while Mr. Penman has been with the company since 1919 and assistant general manager for the past five years.

Franklin P. Clark, recently a lieutenant in the Navy Bureau of Supplies and Accounts, has been appointed sales manager of The Upson-Walton Co., Cleveland, Ohio. Lt. Clark has a 20-year background in the steel and wire rope field and prior to his wartime activity, he was associated with The Jones & Laughlin Steel Corp.

Charles E. Lehr, chief engineer of the Bethlehem, Pa. plant of the Bethlehem Steel Co. since 1909, recently retired. He has been succeeded by **John A. Taylor,** formerly superintendent of the Lower Manufacturing Shops.

R. B. McColl

W. L. Lentz

Robert B. McColl, who was recently elected executive vice president of American Locomotive Company, has been succeeded as vice president in charge of manufacturing by **W. L. Lentz.** Mr. McColl directed the company's war production program during the war while Mr. Lentz has been in charge of the company's tank and locomotive manufacturing program for the past five years.

Clay Bedford, general manager of the Henry J. Kaiser Co. shipyards at Richmond, Calif., has been made a member of the board of directors of the Kaiser-Frazer Corp. and appointed vice president and member of the executive committee.

Carl H. Langendorf has been appointed sales and service engineer for the St. Louis territory of the Surface Combustion Corp., Toledo, Ohio, while **Leo B. McCoy** has been named sales representative in the New Jersey territory.

S. U. Shorey was recently appointed assistant manager of plasticizers and resins sales, while **B. B. Lanton** has been named assistant manager of intermediate sales of Monsanto Chemical Company's Organic Chemicals Div.

Robert W. Burnham has been named factory manager and **Maurice Jensen** general superintendent of the Kaydon Engineering Co., Muskegon, Mich.

David F. Austin

David F. Austin has been elected vice president in charge of sales of the United States Steel Corporation of Delaware. Mr. Austin has been acting vice president since June, during which time he continued as vice president in charge of sales of the Carnegie-Illinois Steel Corp., a post which he has held since 1938. He served also for a year and one-half during the war in WPB's Steel Division.

Wendell F. Hess, professor of metallurgical engineering and head of the welding laboratory, Rensselaer Polytechnic Institute, Troy, N. Y., has been elected president of the American Welding Society for 1945-46. Dr. Hess took office at the annual meeting of the society at the Hotel Pennsylvania, New York, N. Y. on October 18.

Harley C. Lee has rejoined Basic Refractories, Inc. as vice president and technical director, after having been in charge of their former subsidiary, Basic Magnesium, Inc.

Phillip C. Johnson has been appointed administrative assistant and **Walter R. Benning** as chief engineer of the chassis division of Willys-Overland.

John A. Foley, for the last eight years manager of the Chevrolet assembly plant at Baltimore, has been appointed manager of the Chevrolet assembly plant under construction in Flint, Mich.

N. B. Williams, associated for four years with the Bundy Tubing Co., Detroit, in charge of electric welding of pressure tubing for the airplane industry, has been appointed superintendent of the Cleveland plant of the United Tube Corp. of Ohio.

George H. Fobian, formerly vice president and director of The Oilgear Co., Milwaukee, Wis., has been elected president of the firm to succeed the late **Harry M. Swigart.**

BUSINESS ITEMS

Thompson Products, Inc. has reorganized manufacturing operations in all Cleveland plants of the company. The re-organization involves the formal establishment of five divisions, grouped along product lines, each division to be a complete business organization. Divisions and their managers are: Light Metals Div., **Arthur Townhill,** manager; Parts and Accessories Div., **Paul P. Johnson,** manager; Piston Ring Division, **Elmer W. Siegling,** manager; Special Products Div., **Leonard W. Reeves,** manager; Valve and Jet Propulsion Div., **Harry D. Bubb,** manager.

Ford Motor Co., Dearborn, Mich., will start construction of a parts depot at Denver, Colo., to supply a complete line of Ford passenger car and truck parts to dealers and owners in that territory. Similar parts depots are being constructed at Seattle, Wash., Houston, Texas, and Des Moines, Iowa, as part of the company's $175,000,000 expansion program.

Lukens Steel Co., and subsidiaries, **By-Products Steel Corp.,** and **Lukenweld, Inc.,** of Coatesville, Pa., will reopen sales offices in Pittsburgh to serve customers of that area. The offices are located in Suite 2000 at 429 Fourth Ave. in downtown Pittsburgh.

The Cleveland Pressed Steel Co., Cleveland, Ohio, bought the former plant of the **National Steel Barrel Co.,** 3860 E. 91st Street, and moved to its new location Oct. 15.

Heppenstall Co., Pittsburgh, Pa., has a new research laboratory without a single window. Brilliant illumination is provided on the workers' tables and tools from powerful fluorescent fixtures recessed into the acoustic ceiling. Rapidly approaching completion, the new laboratory will have 12,000 square feet of floor space.

United Machinery & Tool Corp., Worcester, Mass., has moved its offices and warehouses to 35 Hermon Street to provide for expanded activities.

New **Acromatic Tool Co.,** Detroit, Mich., sales representatives are: Chicago and Wisconsin, **C. B. Cole,** 24 S. Pulaski Rd., Chicago 24, Ill.; Syracuse, Rochester and Buffalo, **Ernest W. Nelson,** 201 Hoover Drive, Syracuse, N. Y.; Southern Calif., **J. W. Billett,** 3664 Agnes Ave., Lynwood, Calif.

The Camden Stud Welding Corp. newly located at Toledo Avenue and East 28th St., Lorain, Ohio, has changed its name to the **Nelson Stud Welding Corp.**

Carbozite Corp., Thermal Products Corp., and **Carbozite Products, Inc.,** have formed the **Carbozite Companies, Inc.,** Pittsburgh, Pa., to conduct the business formerly done by these three corporations.

William A. Thompson, principal partner of **Toolcraft Products Co.,** Dayton, Ohio, has started construction of a $35,000 two story brick addition to the firm's plant to be completed and in use by the first of the year.

Teckna Co., Bayside, N. Y., has acquired a new factory building located at West Warren, Mass.

The American Rolling Mill Co., Middletown, Ohio, and **Rustless Iron and Steel Corp.,** Baltimore, Md., are proceeding with merger plans to become effective at the year-end. The Rustless plant will be operated as the **Rustless Iron and Steel Division.**

R. H. Khuen, formerly salesmanager of **Chrysler Corporation's** powdered metal division, has formed his own company of engineering consultants to assist manufacturers in employing the art of powder metallurgy to the design of postwar products.

Westinghouse Electric Corp., Pittsburgh, Pa., has purchased property and buildings in Meadville, Pa., for the production of industrial heating equipment from **Talon, Inc.**

OBITUARIES

Eric A. Lindquist, 61, died suddenly on Sept. 30. For the past 23 years he has been associated with the Perfection Stove Co., Cleveland, Ohio, where he has served as engineer and designer. Prior to his connection with Perfection he was president of his own engineering works in Middletown, Conn.

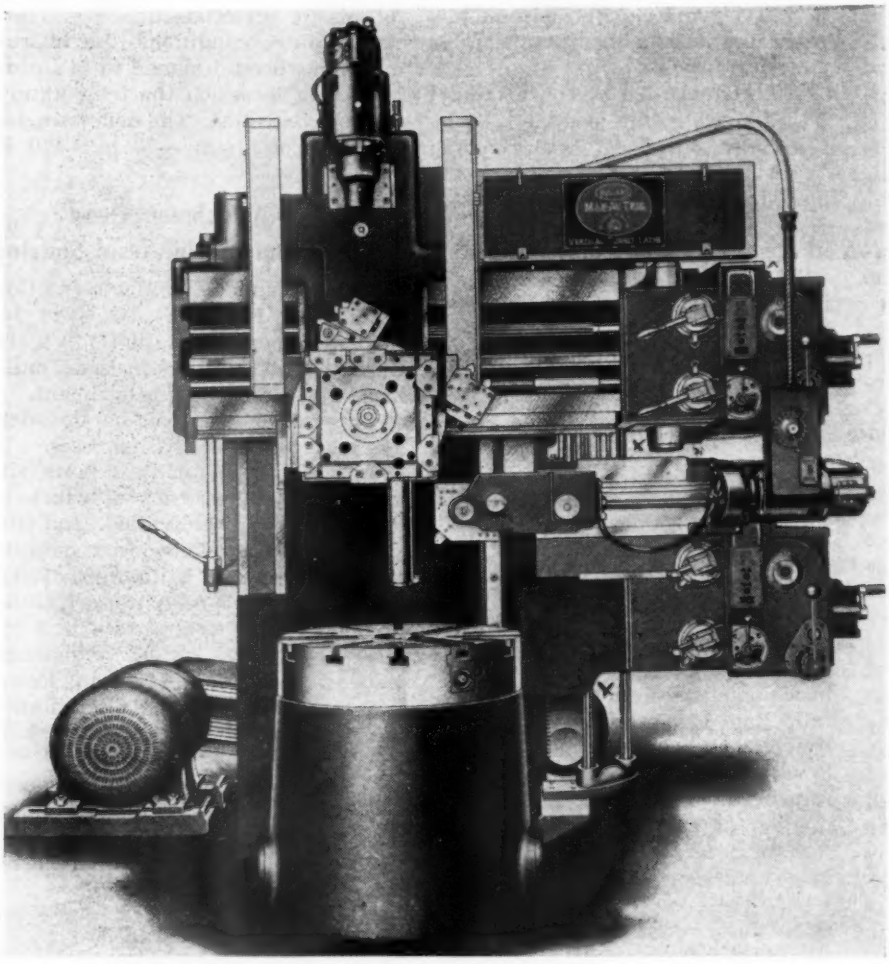
Eugene C. Batchelar, 64, a director of The Motch & Merryweather Machinery Co., Cleveland, Ohio, passed away Sept. 15 after a long illness. Mr. Batchelar served for 36 years as manager of the Pittsburgh office for the company.

MEETINGS

American Society of Mechanical Engineers. Annual meeting. Hotel Pennsylvania, New York, N. Y. Nov. 26-30. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

National Metal Trades Association. Hotel Cleveland, Cleveland, Ohio. Nov. 16-17. Charles L. Batchford, secretary, 122 S. Michigan Ave., Chicago 3, Ill.

Shop Equipment News



Man-Au-Trol units on the heads of Bullard vertical turret lathes provide a mechanical memory to duplicate every function actuated by the operator in machining an original sample piece

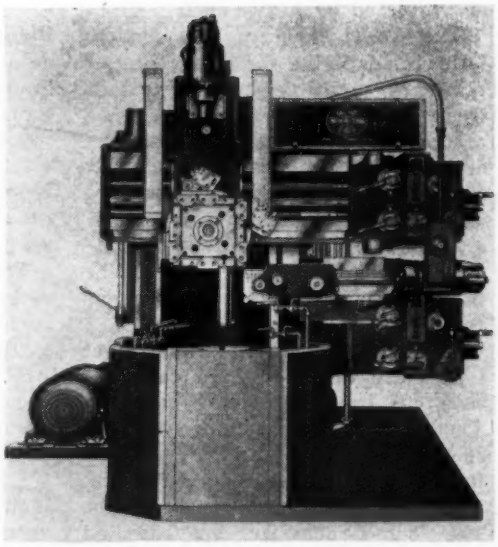
Lathe or Chucking-Machine Jobs Duplicated by Man-Au-Trol Unit

The Bullard Co., Bridgeport, Conn., has developed a lathe control mechanism that will automatically duplicate any job that can be performed on the Bullard Cut Master vertical turret lathes, horizontal lathes or chucking machines. Any combination of control requirements involving 39 or less individual functions of each turret head can be performed without cumulative error. The unit can be converted instantly to manual operation within any cycle and the cycle can be returned to automatic control without affecting the tooling sequence.

Control set-up is accomplished by machining a first piece with the manual controls. As each manual-control function is completed, the automatic control for that function is locked. When all operations are completed and all function stops set, the control is shifted to automatic operation and the set-up becomes 100 percent automatic. At any point in the cycle, the movement of a control lever converts the lathe to manual operation for checking tools, dimensions, or for any other reason, and then returns the cycle to automatic progression without disturbing the tooling sequence. Freedom of operation with manual control, without altering the set-up for automatic control, allows a production run under automatic control to be interrupted at any time to machine entirely dissimilar pieces with manual controls. When manually performed operations are completed, the machine can be shifted back to automatically controlled operation without re-setting or adjusting the function stops.

"Man-Au-Trol" has no predetermined sequence of operating functions and can be adapted to any sequence of operating functions required for a specific piece. The control directs the machine operation in consecutive sequence as set; there is no time delay for by-passing tooling functions not required for the machined piece.

Maximum stroke length up



to the capacity of the machine is obtainable at any point in the operating cycle, and can be instantly varied to stroke as short as 0.005 in.

The machine can be set to permit operation of two or more toolheads at one time. Where tool interference is encountered during a portion of the cycle, the heads can be controlled to stop in any position and start again after the period of interference has passed.

Dimensions of parts can be instantly alterated during the machining process by adjustment of the micrometer electric stops provided for this purpose. Each stop is independent of all others and the setting dial is graduated in increments of 0.001 in. This permits accurate compensation for tool wear without removing the tools or otherwise altering the original set-up.

Feeds and speeds during automatic operation can be set to change automatically to any six of the twenty available; during manual operation, any of the twenty are available at any time. However, this applies only to the sliding-gear type of drive; when change-gear drive is used, there are four conditions which determine the number of speeds available; variable or invariable motor input speed; the choice of a.c. or d.c. operation.

The feeds of the Man-Au-trol vertical turret lathe are actuated by positive feed screws. There are no cams or hydraulic feed cylinders in the feed mechanism. This assures a positive and constant rate of feed regardless of variations in feed rate or depth of cut. Construction of the heads, spindles and drive mechanisms is designed to provide rigidity and is massive to permit the absorption of stresses accumulated by heavy cuts.

The turret head of the vertical lathe is adaptable for either single-point or multiple tooling. Since there is no predetermined sequence of operations on the machine, several different tools can be placed on the face of the turret and brought into action, consecutively or simultaneously, by the automatic control mechanism. One tool can be used for several different cuts, thus reducing the tooling necessary.

Man-Au-Trol vertical turret lathes are designed in a range of sizes up to 80-in. swing capacity. The complete line includes 30- and 36-in. machines, with one or two heads, and 42-, 54-, 64-, and 74-in. machines with one to three heads. The four larger sizes are supplied in any one of six combinations: vertical ram and turret heads with side heads, two vertical ram heads and side head, two ram heads, ram and turret heads, ram and slide heads, vertical turret and side heads.

The vertical turret lathes are driven by individual main motors with auxiliary motors for the main and side heads.

All Man-Au-Trol vertical turret lathes, except the 64- and 74-in. sizes, are furnished with one of two types of tables, either the built-in 3-jaw combination chuck or 4-jaw independent chuck. The 54-in. vertical turret lathe is supplied with a 3-jaw combination chuck, 4-jaw independent chuck, or plain table, while the 64- and 74-in. sizes are supplied with plain table only. The plain table has both parallel and radial T-slots.

The 3-jaw chuck is available in two types, either hydraulically operated or manually operated. The hydraulically operated mechanism is suited for the operation of either chuck or fixture when the work requires a fast method of holding.

Ram heads are optional equipment on the 42-, 54-, 64-, and 74-in. lathes. Either one or two ram heads can be used on the cross-rail. Ram heads are equipped with swivels, but do not have turrets. Several tools can be placed in one ram-head toolholder, allowing a number of cuts without the necessity for a turret. Ram heads on the large machines are recommended where the complexity of the operation does not demand the use of turret heads.

Baldwin Deflection Tester Records Low Deflection Curve

Baldwin Locomotive Works, Philadelphia, Pa., has developed a combination flexure tool and deflectometer for testing molded plastics and woods. The instrument will make tests in bending in accordance with federal specifications and those of the A.S.T.M., and will fit any testing machine.

The deflectometer measures the deflection from the center of the specimen and conveys this to an autographic stress-strain recorder which gives the load deflection curve. One feature permits the operator to adjust the magnification of the deflection in multiples of 5, 10, 20, 50, 100 and 200 times. The high magnification ratio, used for very stiff and brittle materials that deform only slightly before breaking, is measured in thousandths of an inch. The low magnification permits recording large deflections which may be as much as two inches with very flexible materials.

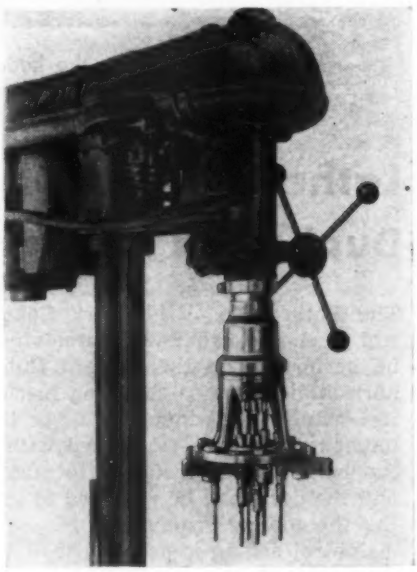
In order to obtain tension, compression and flexure characteristics of plastic materials under extreme temperature conditions, the instrument has been designed to fit inside a cabinet in which the temperature can be controlled. The deflectometer will operate from —70 to +170 F.

Multi-Drill Attachment Head Provides Universal Spacing

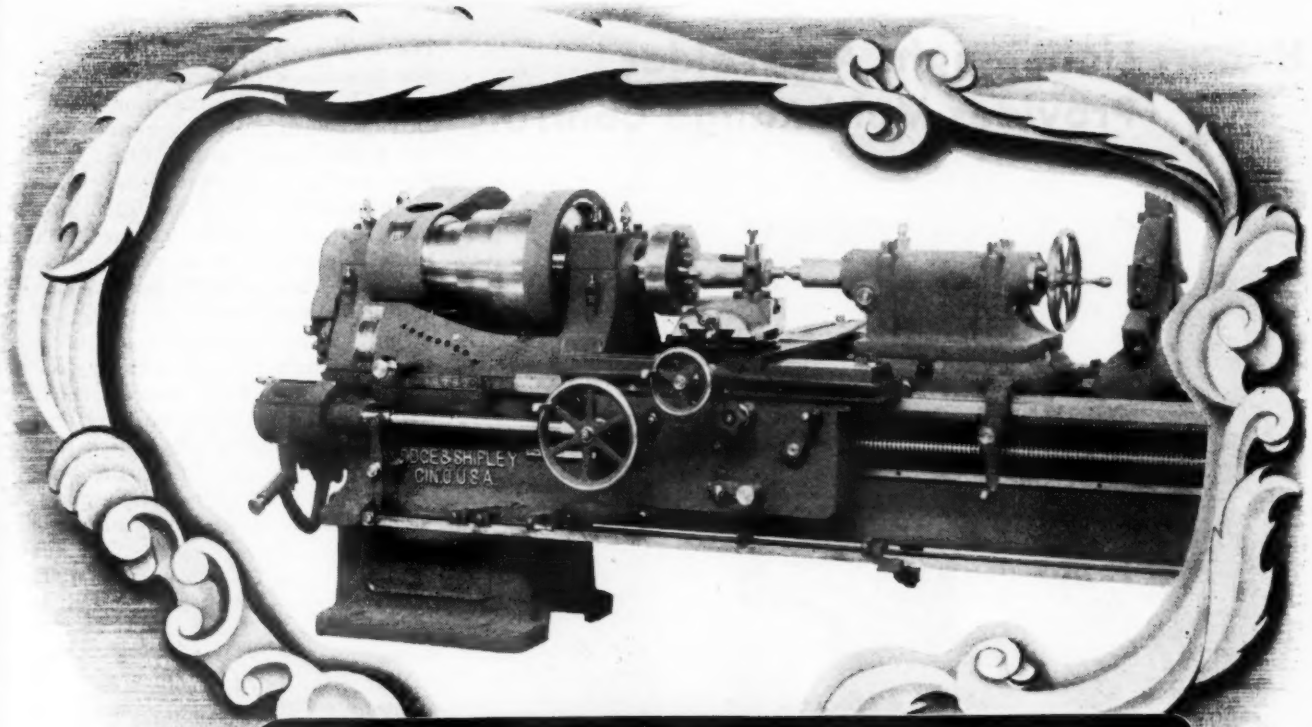
The Commander Manufacturing Co., 4225 West Kinzie St., Chicago 24, Ill., announce the Multi-Drill, a six spindle, universally adjustable, multiple spindle drilling attachment.

This attachment can be installed on most types of drill presses. It comprises a driving head with six movable spindles, each of which is located by an individual, radially adjustable arm. This design permits the positioning of drills up to 17/64 in. dia. in any hole pattern, including a straight line, within a 5 in. dia. circle with minimum distance between centers of 11/16 in. From two to six holes can be drilled simultaneously in one stroke of the drill press.

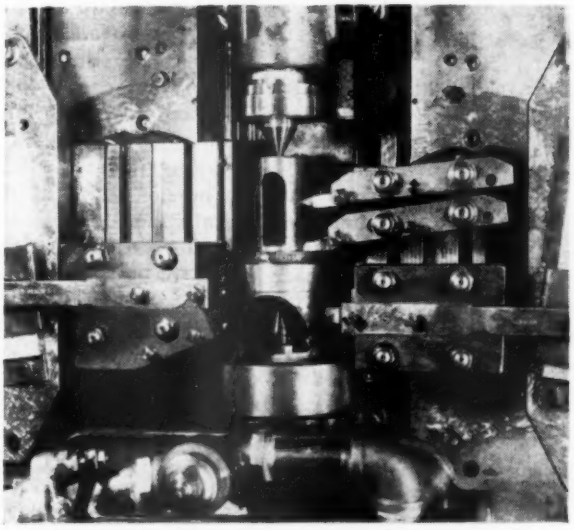
The housing for drive gears, and the supporting frame and adapters, are of special high strength aluminum alloy. The entire attachment weighs 13 lb.



Multi-Drill attachment heads provide single spindle drill presses with the facility of multiple spindle operation



HOW WELL CAN A 1917 LATHE *Do Today's Valve Jobs?*



L & S Engineers will gladly give you a practical demonstration of Duomatic superiority on your own work. There is no obligation. Write for detailed literature No. 601 and No. 620 on 2A and 3A Duomatics.

●Imagine the old-fashioned lathe above being used on a tough chrome nickel alloy steel valve. Limited to a few feeds and a single tool, separate settings were required for straight and taper turning. In those days it took a skilled operator considerable time to turn a valve job.

Obviously, this lathe would be completely inadequate for a shop requiring high output, precision work, and low costs. Yet lathes even a few years old may be almost as obsolete—when placed alongside the new 2A or 3A Duomatic, Lodge and Shipley *full automatic* lathes.

Consider the valve plug at the left done on a 3A Duomatic. Multiple tools perform all straight turning operations at one time, front and rear, and taper turning front and rear—simultaneously. The set-up for two tapers is easily converted to set-ups for tapers of different sizes. An unskilled operator can turn out precision valve parts quickly and economically.

Dual tool slides—front and rear—operate singly or together . . . can be used for a wide range of cycles in turning and in straight and angular facing operations. A Duomatic is like two lathes in one. It may actually equal *several* of your old or pre-war models in total output, plus quality and accuracy never before obtainable.

LODGE & SHIPLEY

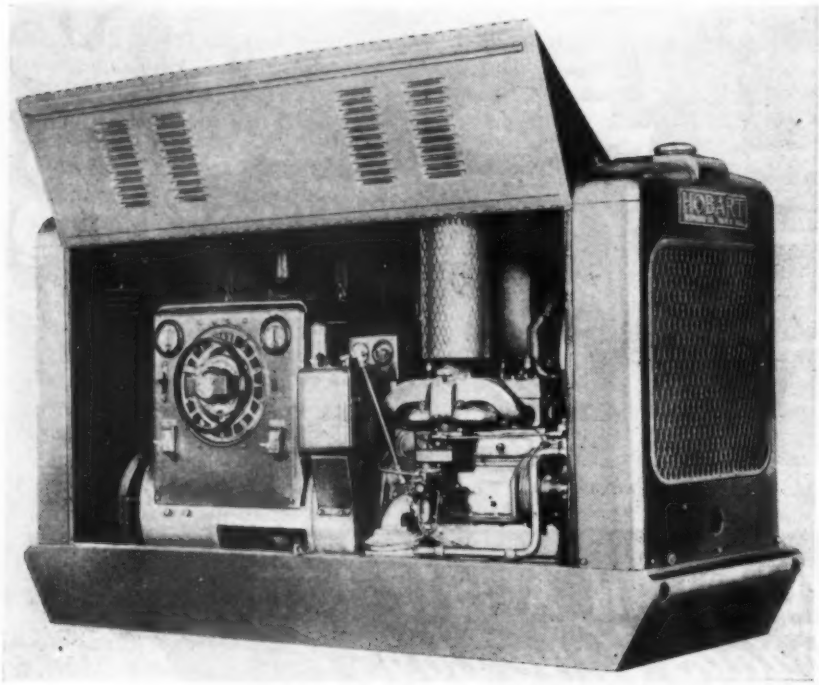
MACHINE TOOL CO.

L & S LATHES

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

Hobart Lightweight Arc Welder Provides Multi-Range Controls



Standard equipment of the Hobart engine-driven welder includes a mercury-type idling device which automatically idles the engine when it's not in use

A lightweight, 200-amp., engine-driven arc welder is announced by the Hobart Brothers Co., Troy 1, Ohio. Completely enclosed in a steel canopy with hinged side panels and powered with a 26-hp., four-cylinder engine, this unit has a range of 40 to 275 amp.

With 10 ranges of welding current and 100 steps of volt-ampere adjustment in each range, the multi-range dual control makes available 1,000 combinations of open-circuit voltage and welding current for selecting arc characteristics.

Remote control allows the volt-ampere adjuster to be removed from the control panel for use with an extension cord so the operator can adjust the welding heat at work.

This arrangement permits the operator to control a variety of jobs requiring volt-ampere adjustments within the range of one of the ten gradations in welding current.

Madco Universal Lathe Angle Holds Irregular-Shaped Work

Madco Products Inc., 516 Fifth Ave., New York 18, N. Y., announced a universal angle plate for lathe use, designed to take the place of special jigs and fixtures ordinarily required for holding irregular shaped work that cannot be chucked in the usual manner.

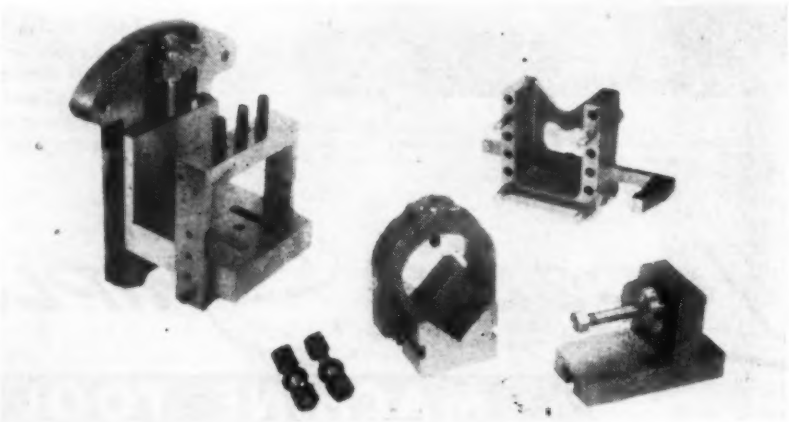
A toolmakers angle plate mounted on an adjustable base for attachment to the face plate of a lathe, this lathe angle plate together with its accessories, makes possible the machining of offset inside and outside diameters, bushing and die plates and irregular-shaped castings, without the necessity of special fixtures.

The angle plate is L-shaped with side face 5⅛ x 4 in. and bottom face 5⅛ x 5⅜ in. It is mounted on a base provided with an adjustment screw and ground ways, and is fitted with gage points so work can be accurately positioned with size blocks or calipers. A straddle clamp with adjustable setscrews is provided to tighten work against the bottom face of the angle plate.

One of the accessories available with the angle plate is a fixture for holding plates. This device, which is useful in machining bushing and die plates, consists of a box-like structure with a T-slot at the bottom for mounting on the angle plate. The side walls of the fixture are provided with holes spaced one inch apart, through which undercut clamp pins can be positioned. When a plate is to be clamped in the fixture, the pins are located to fit the dimensions of the plate. Then, by tightening the nuts on the back ends of the pins, the plate is drawn against the ground surface of the fixture. Once locked in place, the plate can be further positioned by using the adjustment screw on the angle plate, and gage blocks at the gage points if extreme accuracy is desired. This workholding fixture will hold rectangular, circular and irregular-shaped plates up to 5 in. width and 1 in. thickness.

Another accessory available with the angle plate is a large V-block and clamp designed to hold rounds up to 3 in. diam. It is attached to the base of the angle plate with T-bolts and can be positioned at any angle to facilitate the machining of eccentrics, diameters at offset angles, off-center holes or multiple-angle holes.

The third available accessory is a special indexing head which is also



Madco universal lathe angle plates extend lathe facilities to unconventional operations with shapes that cannot be chucked

WHICH DO YOU THINK IS MORE ACCURATE ?

Hob shown is a 2½ inch pitch ground spur gear hob, 5" diameter, 6" long.

"Michigan" hobs, shaper cutters, and other gear cutting tools are produced to limits rivaling the finest of watches. A few tenths of a thousandths of an inch is the top variation allowable at Michigan even in a hob of this size.

That's one reason why gear cutting tools by "Michigan" consistently produce such accurate work. The product can never be more accurate than the tool which produces it.

Further, the engineering department at Michigan Tool Company—Gear Production Headquarters—will be glad to help you, as it has helped others, in selecting and designing the best possible tools for any given gear production job.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

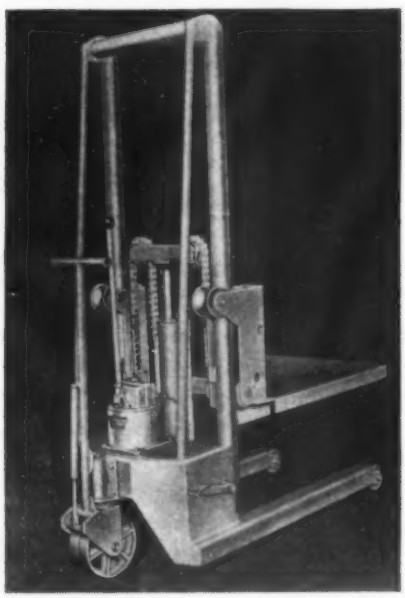
attached to the angle plate by means of T-bolts. It can be secured in any position on the angle plate and is particularly useful in positioning work for radially spaced machine operations. The indexing head consists of a spindle or hub supported horizontally by a projecting pin designed to fit into a ring of holes in the base spaced at 15-deg. intervals. Thus, with this indexing head, facing, boring, and turning can be performed at intervals of 15 deg. or any multiple.

Lyon-Raymond High-Lift Truck Permits Short Turning Radius

Employing light-weight welded tubular and formed-plate construction, the Lyon-Raymond Corp., 2370 Madison St., Greene, N. Y., has added a 2000-lb. capacity hydraulic high-lift truck to its line.

Its light weight makes the truck suitable for transferring materials as well as for stacking and tiering.

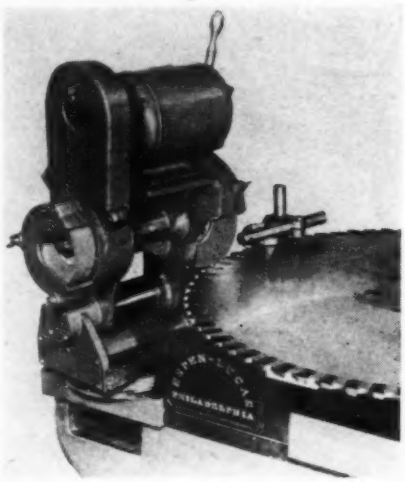
The standard stock model has a platform 30 in. wide by 36 in. long with an elevating range from 6 to 60 in. above the floor. Ease of movement is provided by Timken-equipped 10-in. dia. front and 5-in. dia. rear wheels. A foot-operated floor lock, making two-point contact with the floor, will hold the truck firmly in position when desired. A two-speed hydraulic hand pump is standard equipment or a motor-driven hydraulic pump may be furnished mounted on the cylinder platform at the front end of the high-lift chassis. Full swivel action permits maneuvering in narrow aisles.



Full swivel action, obtainable with the steering wheel of the Lyon-Raymond high-lift truck, permits maneuvering in narrow aisles

Espen-Lucas Saw Blade Grinder Maintains Tooth Contours

A circular saw-blade grinder for sharpening inserted-tooth metal-cutting saws has been announced by Espen-Lucas Machine Works, Front & Girard Ave., Philadelphia, Pa. The unit is designed to grind teeth uniformly to within 0.001 in. and also maintains proper tooth contour. These features lengthen intervals between sharpenings. The grinder, Model 27, has capacity to handle blades from 18 to 48 in. and can be increased to 60 in. Motor required is a ¾-hp., 1,800-r.p.m. Floor space required is 7 × 15 ft.



Espen-Lucas saw-blade grinders maintain proper contour for chip clearance

Hanchett Magnetic Chucks Built of Bi-Alloy Laminates

A laminated top plate of all-steel construction has been added to the electro-magnetic chucks produced by the Hanchett Manufacturing Co., Big Rapids, Mich. Pole sections traverse the entire width of the chuck top. Laminations are composed of magnetic steel ⅛ in. thick and non-magnetic steel 1/32 in. thick.

By utilizing all-steel top-plate construction, the entire top plate can be hardened. Because of the fine spacing of the poles a 22 percent greater magnetic surface is available with this design.

Thin section of laminates in the Hanchett magnetic chucks provide increased area of effective flux

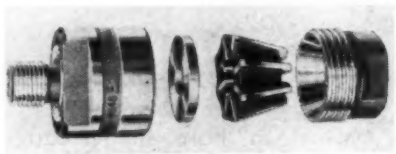
The installation of the moisture-proof coils in the chuck is arranged so the magnetic flux will be transverse to the length or opposing the action of the grinding wheel or cutting tool; reducing the possibility of work slippage.

The laminated top plate is available in the following sizes: 6 × 18, 6 × 24, 8 × 25, 8 × 36 and 8 × 48 in.

Jacobs Drill Chuck Improved By Action of Neoprene Insert

A heavy-duty drill chuck, in which a web of neoprene synthetic rubber keeps the jaws in alignment and permits one chuck to take a wider range of drill sizes, has been developed by the Jacobs Manufacturing Co., Hartford, Conn.

The resilient material replaces the flexible spring-steel collet shank of the single-purpose type drill chuck. The rubber is bonded to the steel jaws and passes through anchoring holes in them, a design which makes the collet or inner socket of the chuck a compact, conical unit. The Rubber-Flex collet is tightened by a screw mechanism which forces it forward into the funnel-shaped nose of the chuck. As soon as the chuck is loosened for changing drills, the neoprene web pushes the jaws apart and releases the drill shank.



Twelve of the Rubber-Flex collets and three detachable arbors will handle operations which would require 300 single-purpose collets

All working faces of the hardened alloy-steel jaws are ground after assembly in the neoprene matrix. Because the jaws are always parallel,

Now MIDGET CARBURS IN Standard Sets

FOR TOOL ROOM, DIE SHOP, PATTERN SHOP and GENERAL PRODUCTION USE

INDUSTRY'S first carbide rotary files are now furnished in midget sizes in attractive sets for tool room, die shop, pattern shop and general production use. This set consists of 12 tools of assorted shapes furnished in an extremely practical and attractive plastic case which provides a convenient method of keeping the tools in perfect condition.

Designed and manufactured to provide another time saving tool for industry, they have proved themselves an invaluable replacement for hand files and mounted grinding wheels in innumerable operations requiring these tools. The extreme hardness of tungsten carbide permits these tools to be used on practically any material, including hardened steel up to 65 Rockwell C. They will cut many times faster than grinding wheels, being run at speeds from 65,000 to 100,000 RPM. Sharp corners, forms and radii can always be maintained. On softer materials the same advantages are apparent, and in addition their life is at least 50 times that of steel files.

The twelve tools in this set are solid tungsten carbide, 1⅛ inches overall with ⅛" diameter shanks. A new descriptive bulletin, containing full specifications, will be sent you immediately upon request.

NET PRICE for SET No. 1 (ILLUSTRATED)

$67.20

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

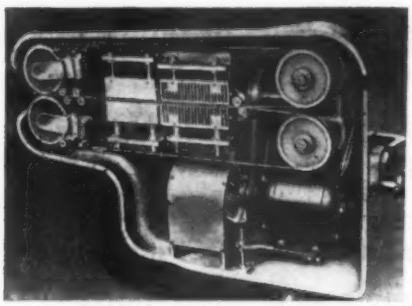
1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

they maintain full-length contact with the drill shank, thus providing more gripping area and increased accuracy. The design is such that, in use, the collet is self-tightening, with a toggle-like action.

Sav-Way Plastic Heat Sealer Closes Thin Film Inclosures

A process for joining plastics or foil for heat-seal packaging is announced by Sav-Way Industries, Detroit, Mich. The machine is designed to handle both plastic film and foil and Grade C sealable paper, wax impregnated or wax coated.

An electronic temperature control holds heater bars within one degree up to 500 F. Steel belts carry the material to be welded between the heater bars, from 10 to 38 ft. per min. at controlled pressure, and through a cooling zone in one operation. Pressure between heater bars is adjustable and held by spring tension to precise limits, and the bars are mounted to be self-aligning. Wiper type oilers of heavy felt are provided to wipe the metal belts and prevent them from sticking.

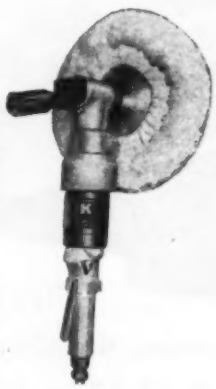


The Heat-Sealer handles plastic films and foils. Underneath the groove are two metal belts that carry the material to be welded through heater bars and through a cooling zone at the other end. Temperature, pressure and belt speed are all variable and subject to precision control

The design of the heater bar face, which concentrates heat in the center of the weld, distributes heat gradually to the outer edges. The cooling zone, like other steps in the process, is controlled to cool the film gradually after welding to prevent distortion. The machine is designed for use in conjunction with a moving belt which can be synchronized to the speed of the metal belts, and will carry units to be sealed at a uniform speed.

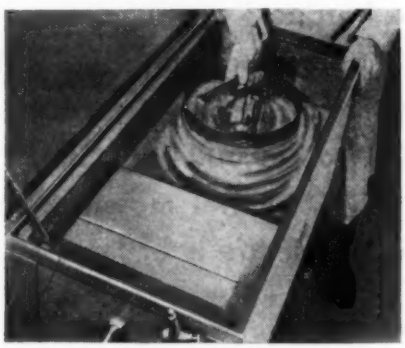
Keller Pneumatic Buffers Built of Lightweight Parts

A smooth surface finish on metals, woods or plastics may be accomplished by the Keller 20 PA angle-type buffing tool manufactured by the Keller Tool Co., Grand Haven, Mich. The unit operates at 2300 r.p.m. with a 7-in. lamb's-wool buffing pad.



Light weight, a conveniently located support handle and a fingertip air valve at the base, of the Keller buffing tool, minimize fatigue and discomfort

Pneumatically operated, the tool has a plastic handle and other lightweight parts have been employed, wherever possible, to reduce the total weight to less than 7 lb. without impairing its power.



The Park parts cleaning machine, ordinarily agitated by air pressure, can be used as a hand dip tank for quantities of small parts

Park Parts Cleaning Machine Agitates with Air Pressure

A portable parts-cleaning machine, which agitates the cleaning fluid by air pressure is announced by the Park Chemical Co., 8-74 Military, Detroit 4, Mich.

Designed for use in repair shops, this unit will remove grease, grime and carbon from carburetors, tools, electrical parts and instruments, without the application of heat.

Two systems of cleaning are combined in the unit. Large parts to be cleaned are placed in the tank and the cleaning solution is agitated by air pressure. The air is dispelled from a series of holes in a pipe which runs lengthwise at the bottom of the tank.

Small parts, such as screws or washers, are placed in the round basket and soaked in the solution. The basket can be revolved or swished by hand. After the parts have been cleaned, the rack is placed on an attached drain-shelf which drains the solution back into the tank for re-use. Parts are then blown dry by means of an air gun and rinsed with water or petroleum spirits.

Optimus Single-Stage Washer Equipped for Portability

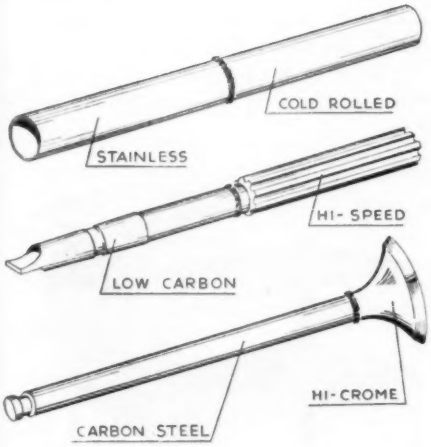
A single-stage washer, which permits rinsing and washing in one unit, has been announced by Optimus Equipment Co., Church Street, Matawan, N. J. The unit is portable, permitting it to be spotted wherever the work is, eliminating the need of bringing the work to the machine, and the unit can be moved on to another spot as the flow of work eases on shifts from department to department.

The unit is small, occupying a floor area of 12 sq. ft. The unit is complete with moving jets and vertical sliding doors that control splash and spray. It can be equipped with any type of heating device and thermostatic control.

Optimus single-stage washers are self-contained and can be moved from point to point to accommodate work requirements

HOW TO WELD

DISSIMILAR METALS TO MAKE ONE PART...and make it for less



With the introduction of the new PROGRESSIVE lines of flash welder there is almost no limit to the ease with which all kinds of sizes and shapes of parts of even DISSIMILAR METALS can be fused together and blended into each other to become one solid part.

Not only do these machines make it easy for the shop to produce what the engineer designs, but they also remove restrictions on engineering design. Now you can design and produce parts composed partly of low carbon, partly of high carbon; part high speed and part carbon steel; part stainless or other alloys, etc., taking full advantage of the functional characteristics of each material—and produce them at the kind of costs you are aiming at in this highly competitive era.

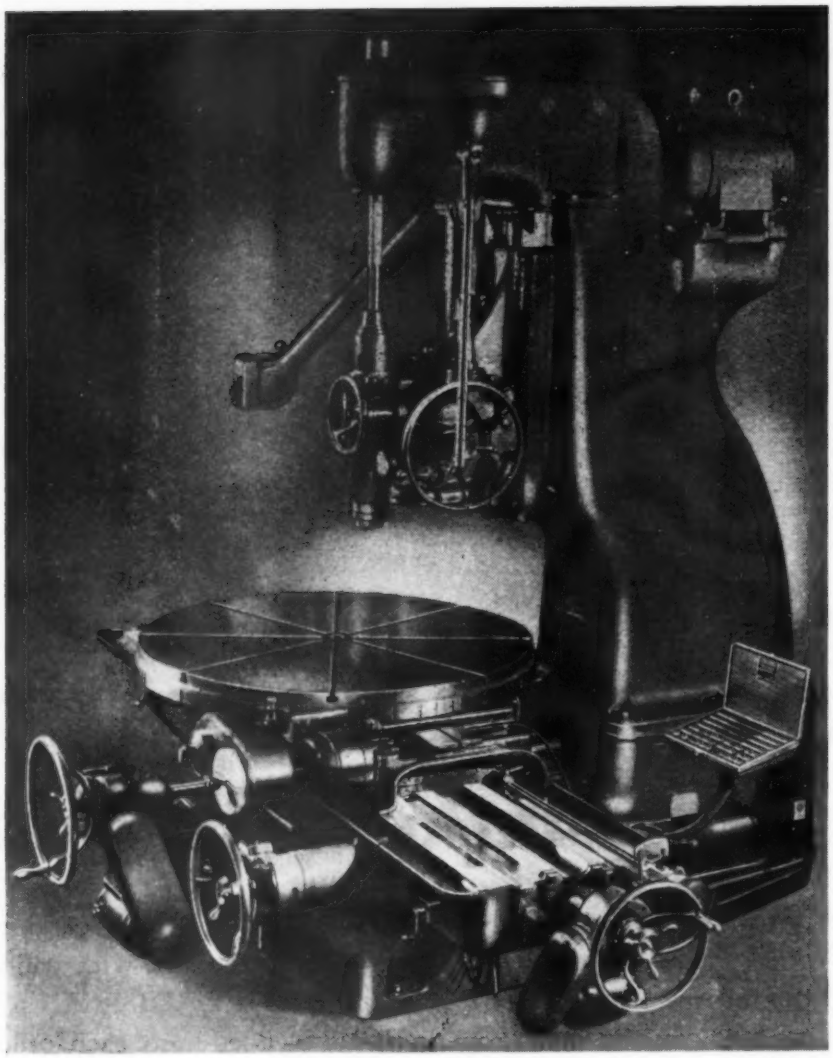
We will be glad to send you Bulletin No. 202 on the new PROGRESSIVE flash welders.

IT PAYS TO WELD

PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT

Pratt & Whitney Jig Borer Equipped With Indexing Table



The rotary indexing table provided as an integral unit of the Pratt and Whitney 3B jig borer extends its uses to include small-lot production of precision parts, where the improved layout facilities obviate the necessity of locating work points by other means

Pratt & Whitney Division of Niles-Bement-Pond, West Hartford, Conn., announces a feature which has been added to the No. 3B jig borer. This feature is a large, non-detachable, precision rotary table built into the machine. Two table sizes are available: either 42 or 48 in. dia. This makes available equipment for precision boring to polar coordinates, on large work, in addition to rectangular coordinate work. Either one type or the other, or both, can be handled without change in setup. The rotary table replaces the regular plain rectangular table on the machine.

The table is equipped with a precision worm indexing mechanism which provides excellent accuracy for average work. For closer accuracy, a spacing system is provided in the outer rim.

Power is provided for indexing the rotary table, in addition to the regular horizontal and transverse power traverse on the machine slides. Suitable binders lock the table in position while work is being bored.

Work capacity of the two built-in tables is large. Either will handle holes bored on a diameter of 53-½ in. The largest outside work diameter that will clear the column ways is 71 in. If the work will fit into the gap below the column ways (less than 14-⅛ in. above the table) the maximum outside work diameter can be increased to 89 in. The standard distance from the table top to the spindle nose is 24-⅛ in. Both this and the gap distance can be increased as desired by using raising blocks under the machine column.

The general construction of the table is extremely rigid and provides for handling large jigs, fixtures and tools. The machine also will function for certain precision milling jobs within the limitations for which the jig borer can be expected to be used for this type of work. For this reason, the machine is valuable also as a means of precision manufacturing on small-lot production where the layout features will save an otherwise large amount of locating by other means.

Palmer-Shile Stockroom Truck Includes Checker's Workspace

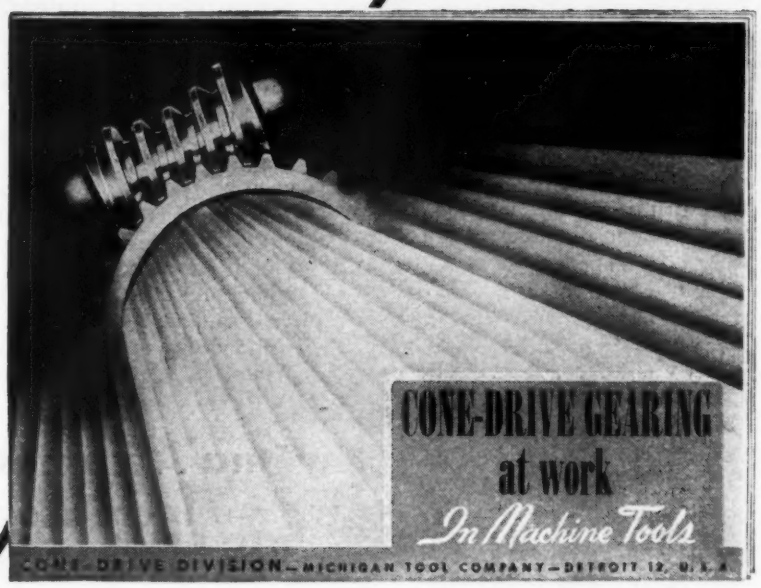
A stock checker's truck is announced by Palmer-Shile Co., 780 South Harrington Avenue, Detroit 17, Mich. This item self-contains a conveniently placed writing table and stationery rack.

The construction is all steel welded, with three sheet-steel shelves which have a 1-in. flange all around. The tubular handle is positioned to form a protective bumper for the stationery rack. It is fitted with four rubber-tired, ball-bearing casters; two (at push-handle end) swivel, while the other two are rigid.

The over-all height to top shelf is 42½ in. and to the top of writing

Palmer-Shile stock checker's truck provides space for marking and storage of inventory sheets

How POST-WAR MACHINE TOOLS will get their



—SPEED POWER SMOOTHNESS

Many major producers are using CONE-DRIVE gearing to obtain these three attributes in machines designed for Post-War use. The story is told in a new booklet now available from the CONE-DRIVE DIVISION.

The reasons so many machine tool manufacturers are turning to CONE-DRIVE gearing are inherent in that gearing itself:

1. Large actual area contact between gear teeth and more teeth in contact, resulting in vastly higher load carrying capacity and smoother power flow.
2. Ability to generate gears that have the *exact* amount of backlash desired.
3. Ability to resist wear. CONE-DRIVES tend to wear "in" instead of "out". They actually become *quieter with use.*
4. Greater compactness by virtue of the greater load carrying capacity for a given size.

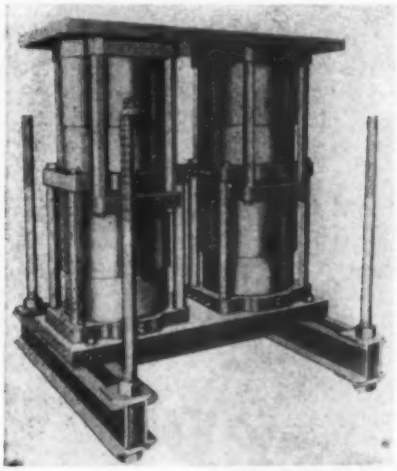
We will be glad to send you a copy of this booklet. Ask for Bulletin #632—CONE-DRIVES IN MACHINE TOOLS

CONE-DRIVE DIVISION **MICHIGAN TOOL COMPANY**
7171 E. McNichols Road, Detroit 12, U.S.A.

table, 50 in. The floor clearance is 9½ in. From the lower to center shelf the height is 18 in. and between the center and top shelves, 12 in. The writing table is 20 in. wide by 14 in. deep. Stationery rack is 20 in. wide by 8 in. high in front; it is 3 in. deep at top, tapering to 2 in. at bottom.

Rogers Tandem Die Cushions Equalize Off-Center Loads

Multiple tandem type heavy duty pneumatic die cushions, manufactured by the Dayton Rogers Manufacturing Co., Minneapolis 7, Minn., in cylinder diameters from 6 to 24 in., have capacity for draw-ring holding pressures of 6 to 100 tons. The hardened and ground pin pressure pad is custom built to fit specific press bed openings and is held in constant parallel working alignment by the equalizing tandem cylinder construction which compensates for all off-center loading.

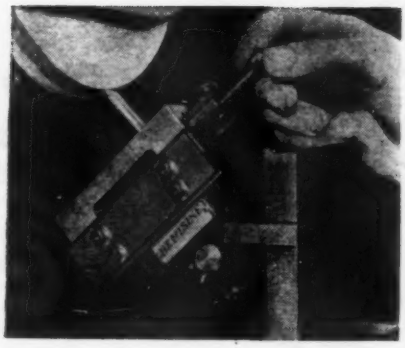


Dayton Rogers tandem die cushions equalize off-center application of press tonnage and maintain maximum draw-ring holding pressures

The adjustable supporting structure is designed so the four suspension rods can be mounted to the press bed lugs at any given spacing. A centralized lubricating header block makes possible the lubrication of all cushion cylinders from the side of the press. This type cushion, model 2CC, is adaptable to large straight-side presses where maximum ring holding pressure is required in proportion to total press tonnage and where off-center dies impose excessive strains on single unit die cushions.

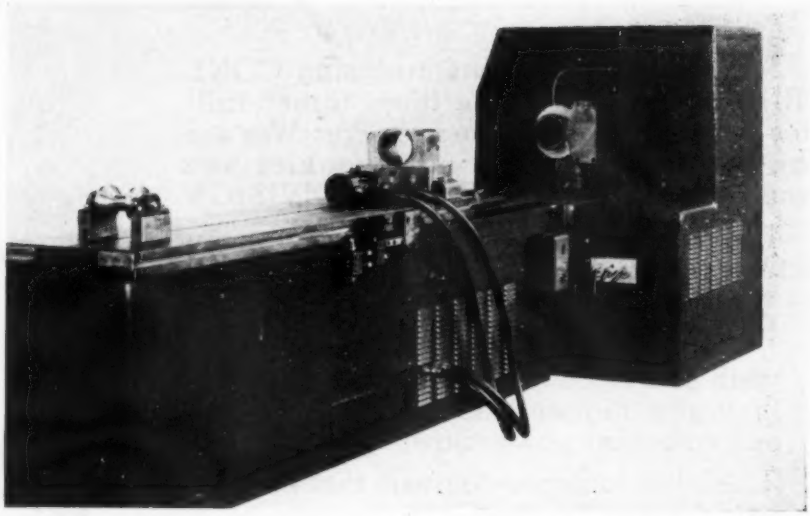
Bemisine Sine-Angle Dresser Facilitates Dual Purpose Use

Bemisine angle dresser, a device for dressing angles on surface grinder wheels, has been announced by Nichols Morris Corp., 50 Church St., New York 7, New York. A precision-fitted sliding member carrying a diamond dressing tool is mounted on an adjustable sine-angle plate which locates on the magnetic chuck directly below the grinding wheel. Ordinary 2-in. micrometers are the only measuring instrument required to set any dressing angle, from 0 to 90 deg., to accuracy within one minute of arc. After the desired angle is determined, the diamond tool is brought in contact with the wheel and the slide moved back and forth, manually, to generate a corresponding angle on the wheel. When not required for angle dressing, the sliding attachment can be quickly removed from the sine-angle plate, leaving a working surface prepared for holding small parts at accurate angles for grinding, milling, or jig-boring operations.



Bemisine angle dressers can be used as a conventional sine plate as well as an angle dresser

Etna Automatic Feed Mechanism Increases Production of Cut Tubes



Actuating mechanism of the feed table attachment, for Etna cut-off machines, can be provided to operate either electrically or hydraulically

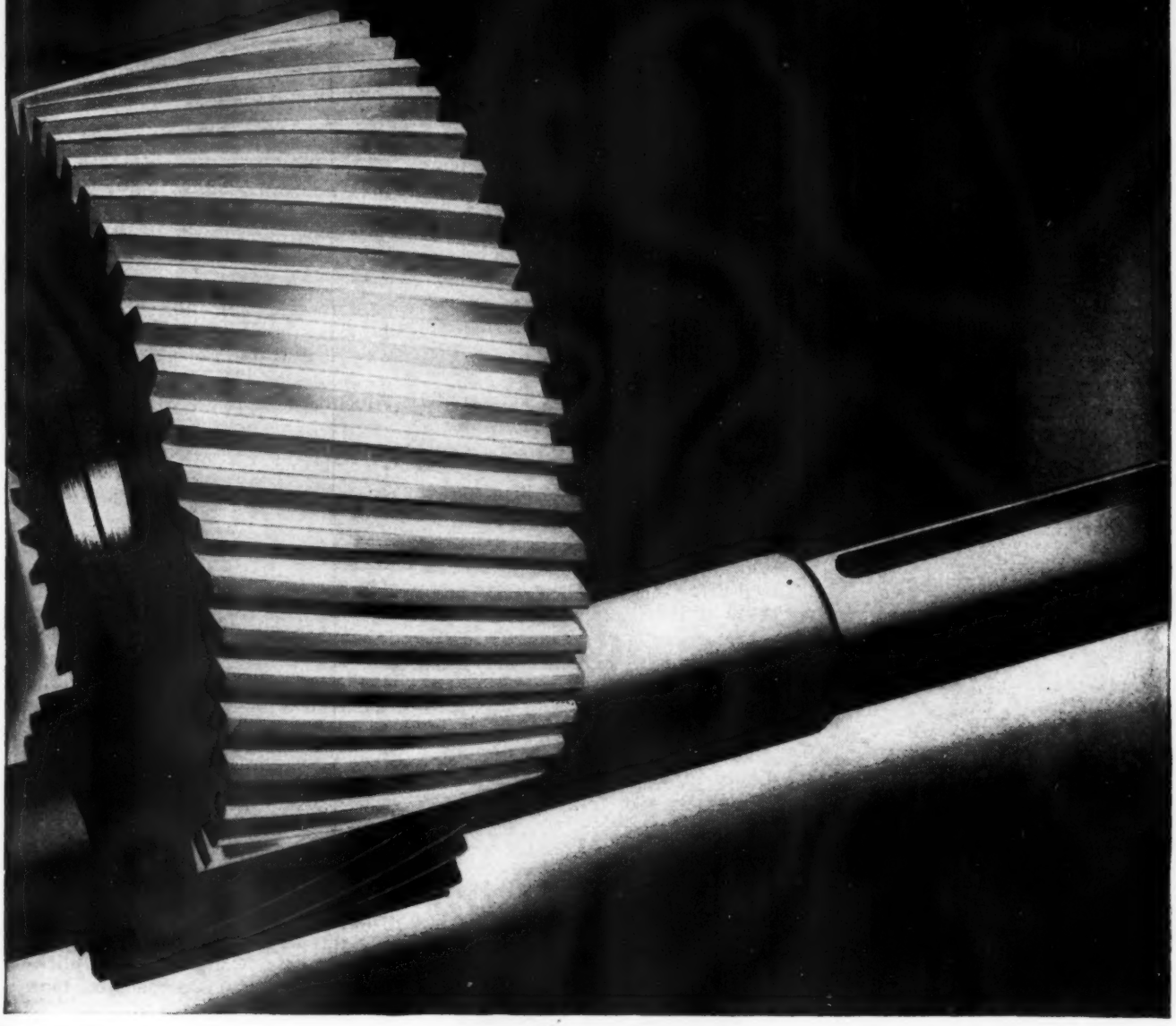
A feed mechanism, for attachment to Etna tube cut-off machines, is manufactured by the Etna Machine Co., Toledo, Ohio. The mechanism is adapted for either hydraulic or electrical actuation.

With the hydraulically operated machine, the tubing is clamped and the feed oscillated by hydraulic cylinders operating in sequence. The electrical design performs this sequence by means of electric motors and ball bearing lead screws; each motion cycled by electrical interlock.

No gaging for length is done on the tubing itself. The length to be cut is preset on the feed table by means of positive stops. The oscillating table is provided with adjustable deceleration means and cushioning at both ends of the variable stroke; thus permitting length tolerances to be held to 0.003 in. Positive cam-stroke stops can be adjusted from ⅛- to 40-in. lengths.

This machine is available with fully automatic controls, which provide for repeat of the feed cycle without attention of the operator, or single-cycle sequence controls.

Molybdenum gives steel the strength and toughness necessary to make long-lived gears.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

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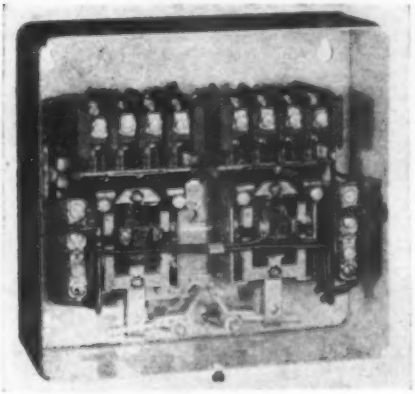
MOLY

Parts and Materials

General Electric Starters Provide Mechanical Interlock

An a.c. magnetic reversing starter, featuring a semi-interference-type mechanical interlock, has been announced by the General Electric Co., Schenectady, N. Y. Available in sizes 0 and 1, the starter is designed for full voltage starting of squirrel-cage induction motors, although it



General Electric a.c. magnetic reversing starters are provided with mechanical interlocks and voltage relays to protect against faulty operation

can be used for reversing service when combined with a reduced-voltage starter.

The semi-interference-type mechanical interlock prevents the closing of one contactor while an arc is maintained on the other, thus averting a short circuit through the arc and the resultant burned contacts and blown fuses. In addition, the interlock arm of the closing contactor assists the interlock arm of the opening contactor in reaching its fully opened position. These interlock arms are case-hardened and their underside faces are buffed and polished to provide long life.

Other features incorporated are under voltage protection, when used with a push-button station or other momentary pilot-circuit device; undervoltage release when used with selector or limit switches; and tamperproof, self-contained, overload relays which allow the motor to operate up to its maximum safe temperature before tripping it off the line. The starter is housed in a metal enclosure 9⅞ x 13⅝ x 4 9/16 in. size, equipped with a hook-on cover and finished with rounded corners. Dust-tight and water-tight enclosures are furnished where special conditions warrant.

Crocker-Wheeler Vertical Motor Equipped With Drip Guards

The Crocker-Wheeler Div. of Joshua Hendy Iron Works, Ampere, N. J., announces an addition to the line of protected-type a.c. motors. A vertical dripproof motor, which is rated at 40 C rise continuous duty with a 15 percent service factor, it is designed for operation from 60 or 50 cycle, 3- or 2-phase circuits at all standard voltages. An NEMA B flange-type mounting up to and including the 284 frame, and an NEMA C face-type mounting up to and including the 326 frame is available.

Crocker-Wheeler vertical motors can be provided with NEMA B or C mounting

All ventilating openings of this line of motors are shielded against the entrance of dripping liquids and falling particles. Oversize ball bearings are provided to carry thrust in addition to the rotor, and the use of a centrifugal bearing seal permits the use of softer grease for better lubrication and longer bearing life.

A recessed junction box, which provides ample room for making electrical connections, is employed in the design. The Crocker-Wheeler Alucast rotor, with bars, fans and end rings cast in one operation from aluminum alloys, is used. Other features include heavy cast frame construction, and coils protected with Vinylastic insulation.

Shallow Well Air Controls Prevent Ice-Bound Condition

An air control for shallow well pumps is announced by Manning, Maxwell & Moore, Inc., Bridgeport, Conn. The device features a rubber diaphragm as the single moving part which combines the functions of valve head, gland seal and float hinge. The valve has stainless steel orifices and is completely sealed. It has no water cavities and cannot freeze. Body is either cast brass or cast iron. Unit is compact and light weight, measuring 1¾ in. between wrench flats. Control is for applications up to 80 lb. per sq. in. tank pressure.

Amglo Constant Speed D.C. Motor Will Operate Synchronously

A constant speed d.c. motor has been developed by the Anglo Corp., 4234 Lincoln Ave., Chicago, Ill., to supply a.c. motor performance to d.c. The motor is adaptable to synchronous operation; formerly possible only through the use of a.c.

It is simple in design and constructed for land, aircraft, or marine use. According to test under actual working conditions, the Amglo constant speed d.c. motor maintains constant speed regardless of wide varia-

BUT **Hiroshima, where millions of ball bearings were stock-piled, was target for the first atomic bomb in history.**

AND **Schweinfurt and the other Nazi ball bearing centers were primary objectives of our bombers in Europe.**

Yes, the heart of *any* nation's industrial might is the ball bearing.

Nothing rolls like a ball. It is nature's favorite, strongest form. Thus, the *ball* bearing is a "natural" for the higher speeds, heavier loads and greater rigidity demanded by today's exacting production standards.

When designing your new machines, take advantage of the creative engineering, technical skill, long experience and precision manufacturing methods of New Departure—the world's greatest maker of ball bearings.

NEW DEPARTURE
BALL BEARINGS

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NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN • Branches in DETROIT • CHICAGO • LOS ANGELES and other Principal Cities

Amglo d.c. motors can be hooked for synchronous operation

tions in voltage. It is self-starting and builds up full speed almost instantly. Current consumption is low (from 0.06 to 1 watt), and shaft speeds may be geared from 1 revolution every 24 hours up to 600 r.p.m.

The Amglo constant-speed d.c. motor has been made available for use at 1½, 3, 6, 12, 24, 32 or 110 volts. Constant speed is maintained even in the case of storage-battery operation; where the voltage is higher when the battery is being charged.

Amco Aluminum Flux Adapts to Welding, Brazing or Soldering

The American Solder & Flux Co., Philadelphia, Pa., have developed a compound which combines in one formula a product which serves as a flux for aluminum soldering, aluminum brazing, or aluminum gas welding. This flux can be used with aluminum brazing rods to braze either rolled or cast aluminum, also, in combination with the proper welding rods, to weld either rolled or cast aluminum.

In soldering operations, the flux may be used with aluminum solders, or with ordinary 50/50 tin-lead solder.

The compound has a low melting point and retains its activity over a wide range of temperatures. It has high fluidity, is an excellent cleaning agent and insures a strong joint.

Amco No. 4015 may be used to solder, braze or weld aluminum to iron or steel, to brass, copper, inconel, monel, aluminum, bronze and other alloys.

TRADE PUBLICATIONS

Aluminum Coating—"Alumox" is a chemical process for producing corrosive resisting coatings on aluminum alloys, described in a 4-page illustrated brochure. The Enthone Co., Dept. AM, 442 Elm Street, New Haven, Conn.

Arc Welding Electrodes—Bulletin L6348-A describes all types of welding rod as to usage, composition, hardness, and handling technique. Additions include five types of stainless steel, chrome-molybdenum hard facing and surfacing, nickel-manganese and molybdenum-manganese rods. Allis Chalmers Co., Milwaukee 1, Wis.

Ball Bearing Quality Control—The Anderometer is a high precision production instrument for testing complete ball bearings for deviations of balls and races from true circularity. Quality Control Bulletin No. 1. Physicists Research Co., 343 S. Main St., Ann Arbor, Mich.

Color Engineering—"New Concepts of Color" is a bulletin dealing with color engineering. This material, though non-technical in language, is based on studies in physiological optics, psychiatry and psychology. McDougall-Butler Co., Inc., Buffalo 5, N. Y.

Compression Type Shock Mountings—This booklet deals with the problems of vibration and shock dampening for light weight supersensitive mechanisms used in rough service. It contains installation plans and specifications, and a discussion of design principles. L. N. Barry Co., 489 Main St., Cambridge 42, Mass.

Disk Clutches—Installation & Data Book No. AM 45, contains 16 pages of engineering information, exploded photographs, and installation drawings of many types of "Maxitorq" floating disk clutches. Carlyle Johnson Machine Co., Manchester, Conn.

Financial—"A Primer for Postwar Prosperity" is a short talk on the economics of increased production; balancing of jobs, workers, incomes, buying power, and goods. J. Walter Thompson Co., 420 Lexington Ave., New York, N. Y.

Gas Welding Supplies — 16-page booklet (Catalog No. 40) contains illustrations, descriptions, engineering data and current prices of Airco gas welding and cutting supplies and accessories. Air Reduction, 60 E. 42nd St., New York 17, N. Y.

Gear Inspection—12-page bulletin No. 91 gives complete description of an accurate method of checking the backlash and runout on all types of gears. Vinco Corp., Dept. A, 8855 Schaefer Highway, Detroit 27, Mich.

Gear Metals—"Ampco Metal in Gears" is a 4-page bulletin describing the use of this aluminum bronze in gear applications, and showing preferred grades of Ampco metal for various types of gear service. Ampco Metal, Inc., Milwaukee 4, Wis.

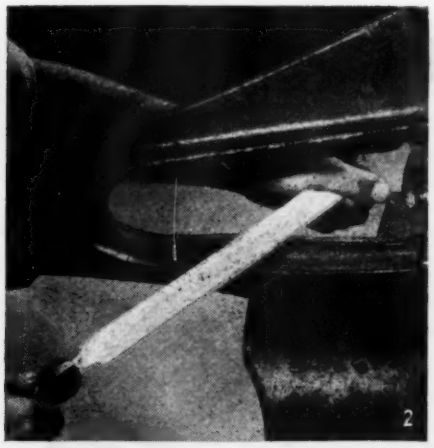
Hardening Method—Booklet called "Fifty Facts" citing actual experience, shows how more than half the tools in common use can be made to work longer and better through the use of a new and better way of hardening soft steels. "Ad-Life" is a supplementary treatment for previously hardened, finished tools. Perfection Tool & Metal Heat-Treating Co., 1740 W. Hubbard St., Chicago 22, Ill.

Index of Products—A directory of the engineering literature and complete listings of the company's products has been prepared to aid consumers in requesting information. Allis Chalmers, Milwaukee, Wis.

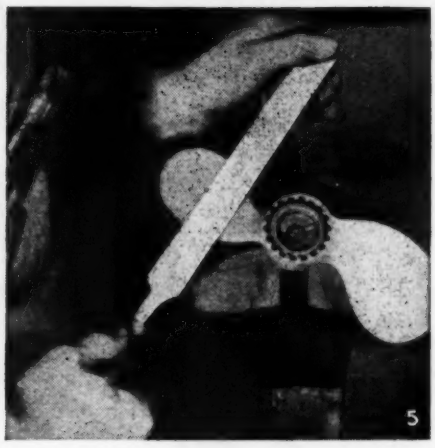
Leather Packing—File-size folder entitled "Packings Pointers" gives information for the design engineer in respect to the selection of cup, flange, U and V packings. Graton & Knight Co., 375 Franklin St., Worcester 4, Mass.

Magnesium Castings — An 8-page folder entitled "Machining and Finishing Magnesium Castings" gives data on tool rakes and clearances, cutting fluids, cutting speeds and feeds, cleaning methods, and the available chemical treatment and polishing and decorative finishings. Superior Bearing Bronze Co., 140 Banker St., Brooklyn 22, N. Y.

Placing Disabled Workers—36-page booklet titled "The Physically Impaired—A Guidebook to Their Employment" was begun in response to many inquiries regarding the problems of providing suitable employment for returning disabled veterans, but the research resulted in conclusions which apply to all physically impaired workers, civilian and veteran alike. National Conser-



WHICH IS "THE RIGHT FILE FOR THE JOB"?



SPECIALIZATION — in tools as well as in occupations — rules industrial practices today. For the countless operations involving filing, Nicholson has gone far to aid metal-products manufacturers—with specialized files definitely proved to turn out work faster, more efficiently and more economically.

How well do your key shop men know modern files?*

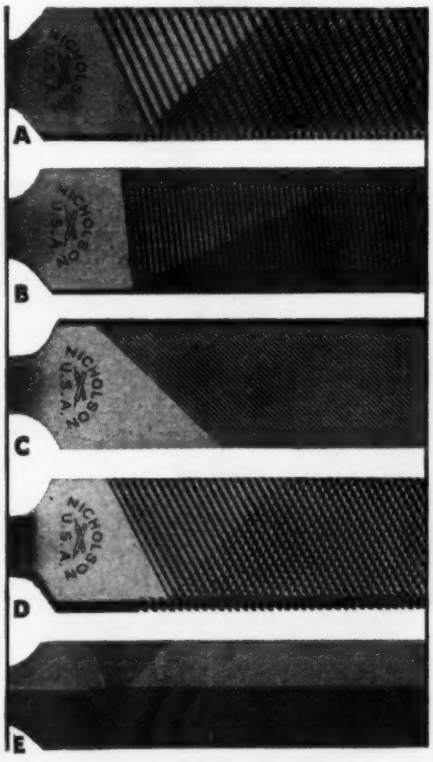
On this page, for example, are five fairly common yet distinctive filing operations . . . and five equally distinctive types of files to fit those operations *properly*. An interesting survey would be to see how many of your production heads and master mechanics can name or associate the right file for each of the operations, namely:

1. Precision finishing a small cam wheel. **2.** "Snagging" a foundry casting. **3.** Finishing a brass valve part. **4.** Lathe filing. **5.** Dressing an aluminum propeller blade. The answers are:

1-E. Nicholson XF. Swiss Pattern Slitting File. **2-D.** Nicholson Foundry File (with extra-sturdy teeth). **3-B.** Nicholson Brass File (note fine long-angle overcut to break up filings and help file clear itself). **4-C.** Nicholson Long Angle Lathe File (provides clean-shearing, self-clearing, non-chatter action). **5-A.** Nicholson Type A Aluminum File with deep "open-throat" upcut and fine overcut.

"The right file for the job" is a long-standing Nicholson tradition, achieved through relentless study of industrial filing problems and advancements in production methods.

★Free Book, *"FILE FILOSOPHY"*



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THE UNIVERSAL INDICATOR WITH TWO READING FACES

No matter in what position this tool is used, one reading face is in plain view for quick, easy reading.

If you've never used the Lufkin Universal Indicator for setting up and checking work, you've a revelation in ease and accuracy awaiting you! It has two reading faces—one on the flat side, the other on the top. At least one is in plain view for quick easy reading. Rotating head makes a complete revolution on its center and on clamping bolt—can be used in any practical position. A twist of one thumb nut locks it tightly. Equipped with standard bar and special attachment. Buy the Lufkin Universal Indicator from your dealer. For free catalog write THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.

LUFKIN FOR ACCURACY

vation Bureau, Accident Prevention Div., Association of Casualty and Surety Executives, 60 John St., New York 7, N. Y.

Plastic Resin—"Durez Casting Resin, a Technical Discussion with Full Instructions for its Use" suggests the contents of 12-page booklet on new material, useful in making dies, jigs and models. Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.

Silicones—New catalog lists all silicone products now available, and contains many charts and graphs demonstrating the properties of this rapidly increasing family of organo-silicon-oxide polymers. General classes include fluids, greases and compounds, resins and varnishes, and "Silastic," the Dow Corning Silicone Rubber. Dow Corning Corp., P. O. 592, Midland, Mich.

Telnic Bronze—Folder gives laboratory report for tellurium nickel bronze. Listed are complete physical, mechanical and fabrication properties, together with many suggestions for its use. Chase Brass & Copper Co., Inc., Waterbury 91, Conn.

Testing Machines—Complete line of precision testing machines of all types and the instruments and attachments used therewith are described in an 8-page folder. Riehle Testing Machine Div., American Machine and Metals, Inc., E. Moline, Ill.

Tramrails—12-page brochure on Ohio Tramrail System analyzes material handling costs and illustrates wide variety of tramrail fittings. The Forker Corp., 1806 E. 47th St., Cleveland 2, Ohio.

NEW BOOKS

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE, EIGHTH EDITION — *1312 pages. Published by the Lincoln Electric Company, Cleveland, Ohio. $1.50 in the United States; $2 elsewhere.*

Arc welding has gone far and fast during the war years. It now remains to apply the latest techniques to peacetime products. The new procedure handbook should be helpful towards this end.

The revision has been thoroughgoing. It incorporates a wealth of new information that obsoletes much of the previous literature on weld-

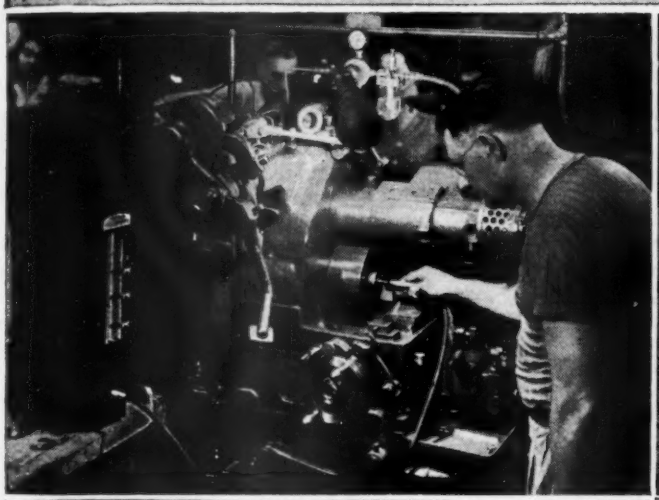
MODERN PROCESS CONTROL

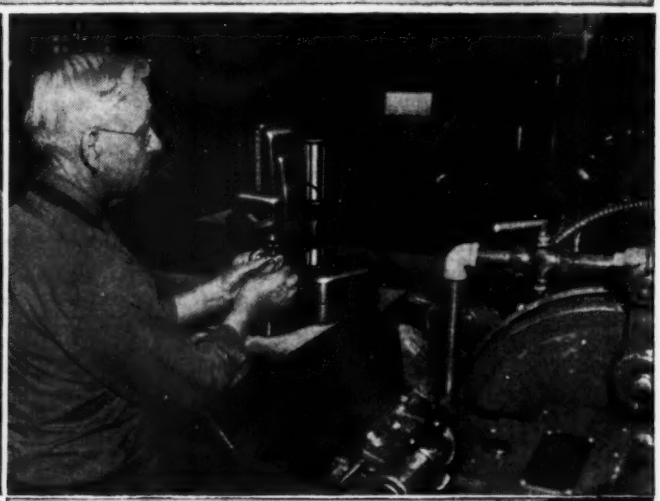
Slashes Production Costs

Today's use of precision indicating instruments at the machines to check parts as they are being produced is a thrifty practice and results in slashing production costs. Inspection of each piece as it is made, with no extra time required, enables the operator to adjust the machine or tools before scrap is produced. Each operator produces a far higher percentage of acceptable parts—good parts which might previously have been improperly rejected are accepted—rejections are reduced—and the scrap pile, as such, is eliminated.

Time is saved on the assembly line because every part fits as it should — no subassemblies have to be torn down and reassembled. Salvage and rework time are practically eliminated. The completed product will be of higher quality, require less service and give more years of trouble-free performance.

Spending money for Sheffield Precisionaires, Visual Gages, Multicheks, Dial Indicator Snaps, Thredcheks, etc. . . . results in saving money by slashing production costs.





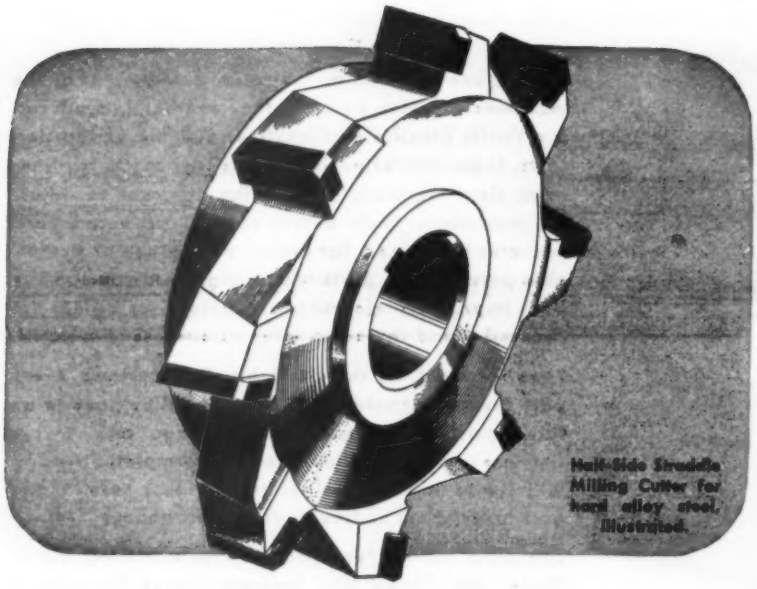
LET A SHEFFIELD REPRESENTATIVE *Demonstrate* THESE INSTRUMENTS . . . and show how they can help you produce high quality products on a competitive cost basis.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

SHEFFIELD MASTER CRAFTSMEN



INCREASE PRODUCTION

as many as

10 TIMES

with these new standard carbide tipped

MILLING CUTTERS

IT'S EASY to increase production as many as 10 times with Wendt-Sonis Standard Milling Cutters. These new milling cutters employ a negative radial and helix angle feature on the cutting edge for milling steel; positive angle for milling non-ferrous materials.

Distinctive Advantages of W-S Milling Cutters

INCREASED SURFACE FEED—Machines hard alloy steel up to 750 surface feet per minute; non-ferrous materials up to 3400 surface feet per minute.

PREVENTS VIBRATION—The built-in heavy lug fly-wheel prevents vibration, adds strength to cutters; lengthens life of tool between sharpenings.

ESPECIALLY DESIGNED—for carbide cutting—not just a HSS design with carbide tips. Recommended for milling all types of material.

EASILY RESHARPENED—on any universal tool and cutter grinder.

Carbide Tipped Tools are a specialty with us. We make them exclusively. Our experience, research, development and improvements are your assurance of complete satisfaction when you use W-S Carbide Tipped Tools. Refer to "TOOLS" in your Classified Telephone Directory, for your local W-S Distributor, or write WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: LONG BEACH, CALIFORNIA.

W-S FACTORY TRAINING COURSE . . . FREE! One week's intensive training, at our factory, in application, use and maintenance of carbide cutting tools. Small classes, individual instruction. Practical facts, actual shop practice. Write for details.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

ing. Specifically it contains 16 new subjects which comprise new cost tables, new welding technique, mathematical calculations for welding design structures, latest steel specifications including National Emergency steels, underwater cutting, shop ventilation, maintenance of welding equipment, methods of testing and filler metal specifications for arc-welding electrodes. The eighth edition carries many new illustrations covering significant welding applications which heretofore have not been published because of restrictions.

•

EMPLOYMENT TESTS IN INDUSTRY AND BUSINESS—*By Hazel C. Benjamin, Librarian, Industrial Relations Section, Princeton University. 46 pages. Price 50 cents.*

The author has prepared a selected, annotated bibliography of literature based on industrial experience. The material gives reference to books, pamphlets and magazine articles relating to tests conducted for industrial jobs. The material concerns specific types of tests, including aptitude, trade, intelligence, personality, interest and accident proneness. Another section is devoted to material based on reports of company experience with testing and of research performed in the application of tests.

•

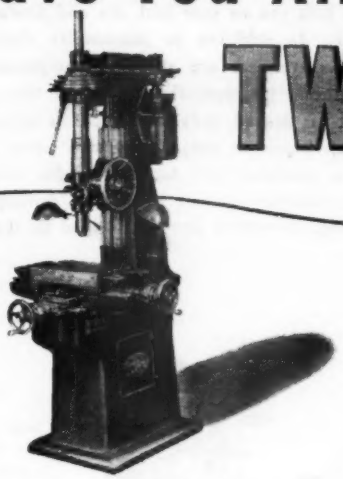
THE MACHINIST'S AND DRAFTSMAN'S HANDBOOK—*By Albert M. Wagner, instructor, Henry Ford Trade School, and Harlan R. Arthur, supervisor, Naval Training School, Dearborn, Mich. 662 pages. Published by D. Van Nostrand Company, 250 Fourth Ave., New York, N. Y. $4.50.*

This handbook is prepared to give machinists and draftsmen the working data required in their everyday work. A good deal of it is devoted to tables and formulas having to do with such machine components as threads and gears and with such metal-working operations as drilling, milling and press work. Tables also include those required for mathematical computation such as areas and volumes of geometric forms, weights and measures, triangulation and logarithms. Other subjects covered by the handbook are feeds and speeds of machine tools, strength of materials and mechanics.

From the vast amount of material available only that has been selected

Have You All the Information You Need?

TWO RETOOLING MUSTS

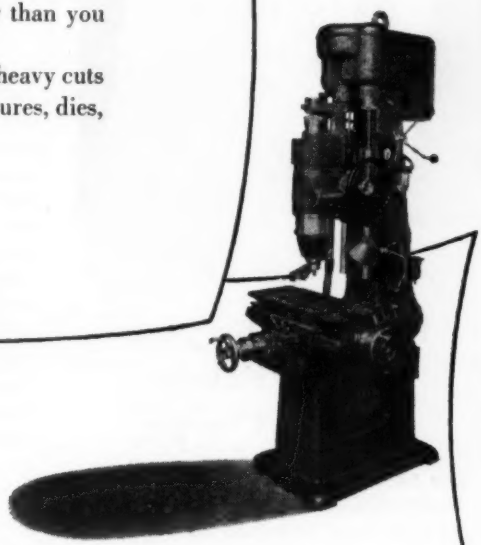


Spots...Drills...Bores and Reams
All Holes In a Workpiece
With Minimum Tool Changes

With the Moore Jig Borer, there's no stop-and-start to change tools at individual holes for each operation, because there are no size blocks or end measures to labor over. *Built-in* lead screws, accurate to .0002" over 14" of travel, enable you to make table settings faster than you can change tools.*

Highly sensitive for holes 1/32" diameter, yet rugged for heavy cuts up to 4½", the Moore Jig Borer is ideally suited for jigs, fixtures, dies, machine parts and jig-less, small lot production.

MOORE JIG BORER



Mechanically Relocates and Finish-Grinds
Holes in Hardened Parts to .0001"
in ⅓ The Time of Other Methods

The Moore Jig Grinder eliminates hours of checking on the bench and surface plate to correct holes in hardened parts. No toolmaker's buttons or locating plugs are necessary, for this unique machine *mechanically* relocates and finish-grinds straight or tapered holes in ⅓ to ¼ the time required by conventional methods.*

Working to figures instead of to "fit," the Moore Jig Grinder puts die making on an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die.

MOORE JIG GRINDER

*Write today for descriptive literature

MOORE TOOLS

MOORE SPECIAL TOOL COMPANY, INC.

738 UNION AVENUE • BRIDGEPORT 7, CONNECTICUT

CAPEWELL

BAND SAW BLADES

Capewell's

New Handy Chart

Helps Your

Contour Saw Operator

Furnished by your Supply House Without Charge

For 52 different materials this new Capewell Contour Saw Chart enables your operator to adjust his machine to the most satisfactory speed, and to select the most efficient tooth size. This information is charted according to the size and kind of material being worked.

With this chart you not only save time, but you secure maximum life from your contour saw blades. By supplying this chart through Capewell distributors, it is our hope that in addition to producing band saw blades of highest quality, we may help them cut for you with maximum efficiency. Simple call your Capewell Supply House or write directly to our factory.

The Capewell Mfg. Co.
Hartford, 2, Conn.

CAPEWELL

BAND SAW BLADES

for use in this volume which is considered to be most needed and most frequently used in the shop. Omissions of less important data have been made to keep the volume to a reasonable size and cost.

TO THE EDITOR

Dear Editor:

I have in hand a copy of the "Defense Plant Corporation Machine Tool Inventory" published by your magazine.

The question that possesses itself in my mind is what effect is the dumping of this surplus machinery going to have on the machine tool manufacturers of America. From personal experience, I know that some of this machinery would not have been purchased if the buyer had to furnish the funds.

In many cases through the entire war, quantities of these machine tools have not been fully occupied even for a normal working day. It would seem logical to conclude that after the peak production of the war had passed, we could not readily absorb these tools within the Continental limits of the United States and that some plan for their distribution should be worked out whereby sales corporations, either individually or collectively, could receive these tools from the government at their reasonable value and distribute them to replace the worn or destroyed machine tools of Europe, South America and the Orient.

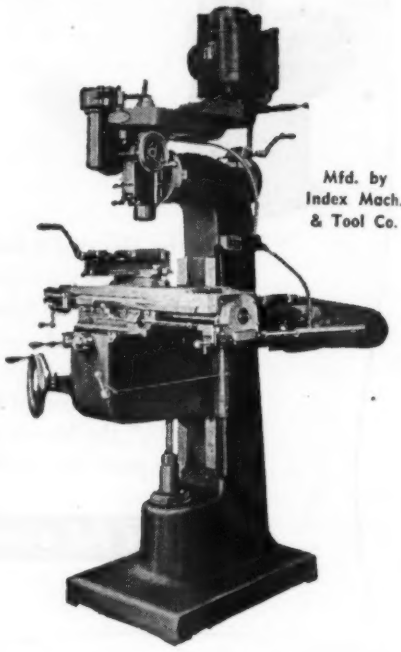
It is quite possible, because of the rapid strides that have been made in the war years, that much of the tooling is now either actually obsolete by tools in being or will be obsolete by tools that are on the drawing board. Most certainly this tooling should be disposed of in foreign markets. In this way the tools that are of latest conception and probably can be used for the next five years without improvement could be sold to our local markets without injury to our economy.

If this program was followed it would give our machine tool industry a market with which they could project the most modern designs conceivable and continue the progressive stride that has been initiated during the war years.

Very truly yours,
Frank Morris
Supervisor, Tool Planning,
Northrop Aircraft, Inc.

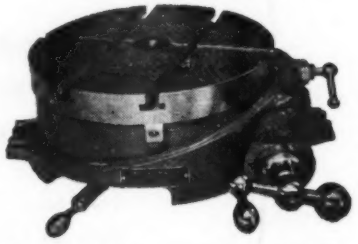
INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

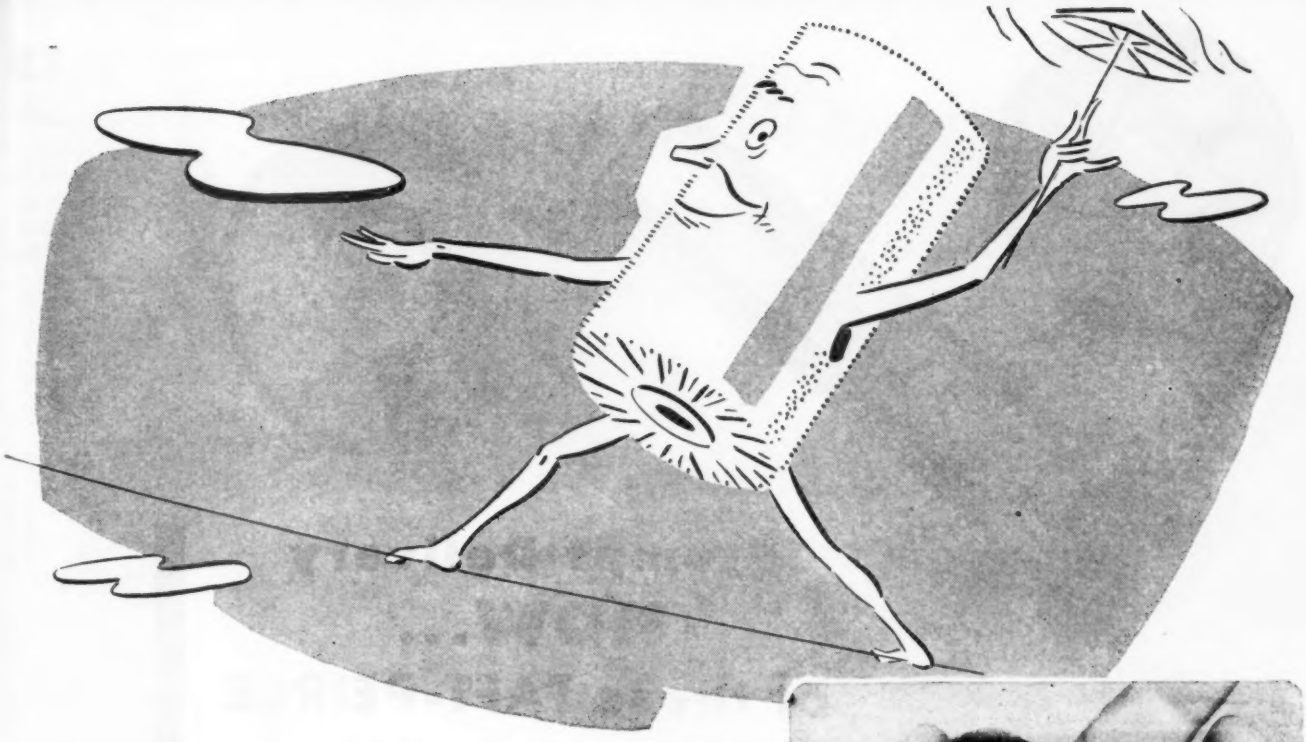


A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.



There's a Brush on the Wire

It's Giving the Best Performance on Record Stripping off Old Enamel

THIS IS THE BRUSH

REMOVING enamel from fine wire has long been a production bottleneck. Scrapers and solvents have been the usual means of doing this, but none of them has ever done a satisfactory job.

Osborn Ringlock brushing wheels, tried out on this assignment, turned in by far the best performance record. Ringlock power brushes can be used to strip almost any type of wire . . . faster, better and at a lower cost per unit.

Stripping wires is only one of hundreds of thousands of operations which Osborn power brushing tools are doing today for American industry. In fact there is hardly a product or a material which does not or cannot use Osborn power brushing techniques to make it *better.*

Better looking . . . better performing . . . and better selling!

Osborn stands ready to give you the benefit of half a century's experience in helping to solve production problems with power brushing. An Osborn field engineer is at your service without obligation. He will make a thorough study of your operations, present or planned, and submit specific recommendations.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

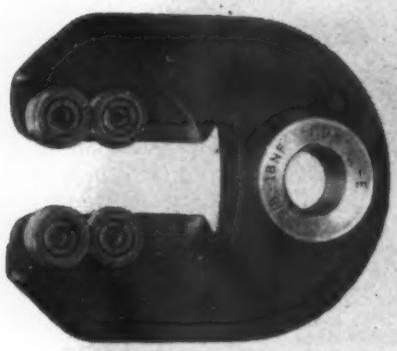
WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

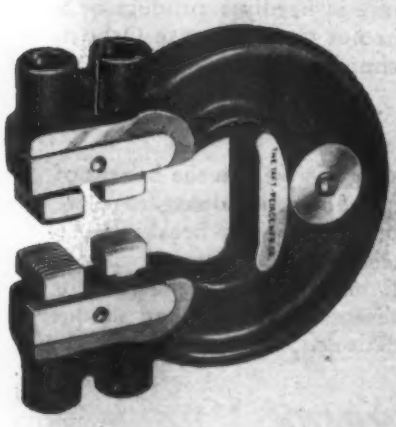
Prompt Delivery NOW... of these TAFT-PEIRCE THREAD GAGES

You can get prompt delivery of Taft-Peirce Thread Plug, Snap, and Ring Gages. These include all types and the Taper Pipe Thread and Plain Taper Gages made to Army-Navy Aeronautical specifications. Also available are the Taft-Peirce Snap Thread Gages which permit the greatest rapidity, consistent with accuracy, in checking work on the production line and in the inspection department.

All Taft-Peirce Gages are made to plus-precision standards in the modern plant of the Small Tool & Gage Division — made to give *you* the greatest amount of work measured per dollar of your gage investment. Order the gages you need right now — write or wire today to: The Taft-Peirce Mfg. Co., Woonsocket, R. I.

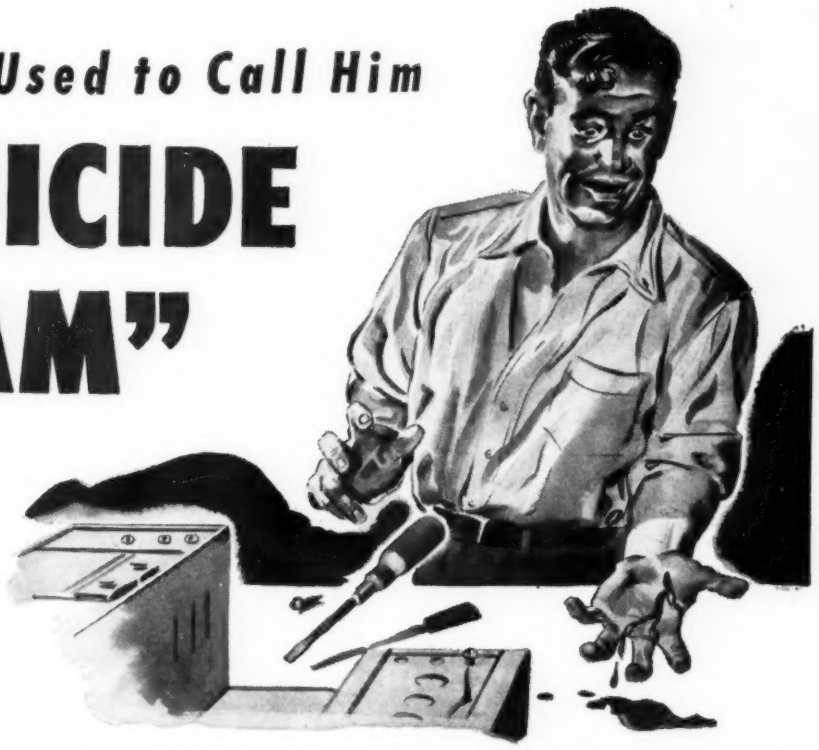
Use Taft-Peirce Gages for Every Gaging Need





They Used to Call Him

"SUICIDE SAM"



. . . because that slotted-screw driver used to slip all the time, and carve him up — ruining his work, and laying him off for a day or so — in spite of the best he could do. And Sam wasn't weak either in body or brain!

. . but he hasn't stabbed himself once . . . since they gave him AMERICAN PHILLIPS SCREWS

A slotted-screw driver is a dangerous weapon . . . because there's no sure way of keeping it in the slot. There are two *open ends* of this slot through which the driver can skid out into trouble . . . slashing work-surfaces or human flesh *or both.*

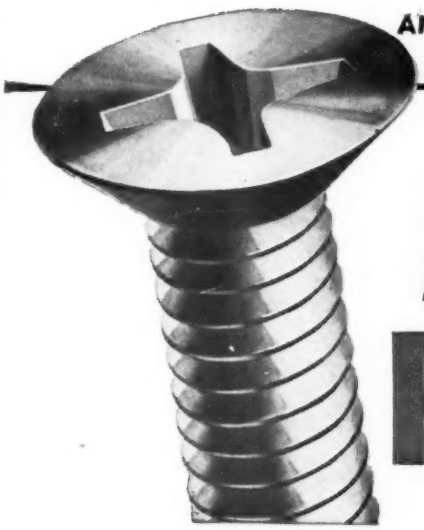
But there are no open roads to trouble in the recessed heads of American Phillips Screws. The 4-winged Phillips Driver can't skid . . . out of this tapered recess, no matter what the driving stress. American Phillips Screws and Drivers fit together firm and straight, and stay that way until the screw is turned up tight. This means safe driving, all the time.

This firm fit means easier driving. For all the worker does is put the American Phillips head onto the bit of his power driver, aim it at the work, and pull the trigger. No straining, no wobbling, *no driving any way but straight.*

NET RETURN TO YOU: TOTAL TIME SAVINGS AS HIGH AS 50%.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building



AMERICAN PHILLIPS *Screws*

FORGING H-P-M presses for flat and closed die forging are revolutionizing the forging industry.

FORMING H-P-M presses are ideally suited for forming heavy metal parts.

DRAWING H-P-M presses are the production standard for deep sheet metal drawing.

THE H-P-M *All-Hydraulic* PRESS ...Industry's Most Versatile Production Machine For PRESSURE PROCESSING

Most products, regardless of their nature, require the application of pressure in their manufacture. In these industries, H-P-M self-contained hydraulic presses are revolutionizing production technique. Deeper draws, less rejects, fewer operations, better grain structure, more even density, faster production and less maintenance are natural results of applying modern H-P-M hydraulics to pressure processing problems. All of these worthwhile features result in *lowering manufacturing* costs.

For 68 years, The Hydraulic Press Mfg. Company's activities have been devoted exclusively to the production of hydraulic presses. This specialized effort has resulted in the most versatile line of all-hydraulic press equipment ever offered for pressure processing. H-P-M is the only builder of completely integrated presses, with press frame, pumps, valves and controls all built by a single organization. Investigate H-P-M presses for your pressure processing work. H-P-M engineers will be glad to discuss your production problems. Write today, stating your requirements.

THE HYDRAULIC PRESS MFG. COMPANY

Mount Gilead, Ohio, U.S.A.

Branch Offices in New York, Philadelphia, Cleveland, Detroit and Chicago.
Representatives in other principal cities.

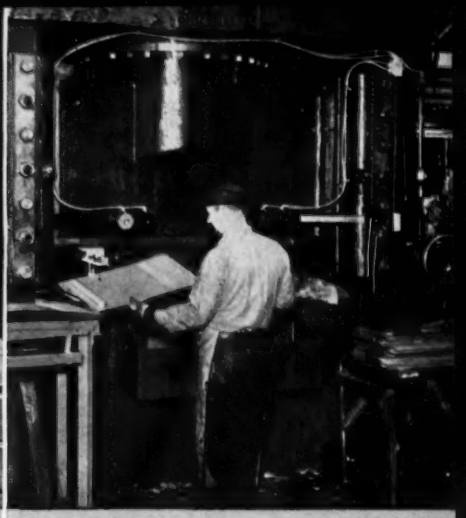
DIE CASTING H-P-M high pressure metal die casting machines are of revolutionary all-hydraulic design.

BENDING H-P-M presses are built for diversified bending of large diameter tubing, structural steel, etc.

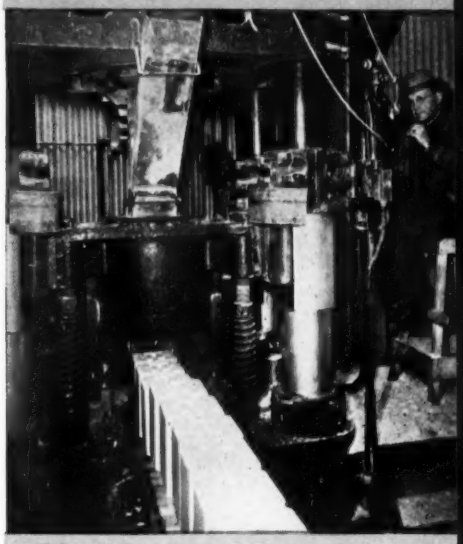
PLASTICS MOLDING H-P-M builds a complete line of plastic molding presses – injection, compression,

COINING H-P-M presses are used extensively for coining and sizing metal parts.

STRAIGHTENING H-P-M presses are universally accepted for die straightening malleable castings.



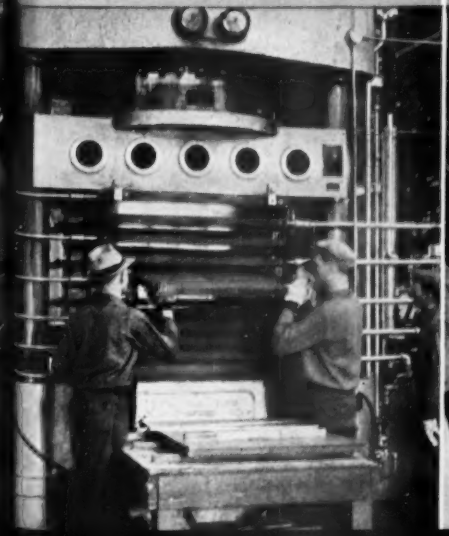
EMBOSSING H-P-M presses provide the answer to mass production metal embossing problems.



BRIQUETTING H-P-M presses briquette many materials — salt, carbon, ceramics, metal powder, etc.

Write today on your company letterhead for your free copy of H-P-M's new 84 page bulletin describing "All-Hydraulic" presses for pressure processing . . . . an informative textbook concerning modern hydraulic press applications for peacetime production.

LAMINATING H-P-M presses laminate many types of plastic impregnated materials.



STEEPING H-P-M presses are employed by leading producers of viscose rayon and cellophane.

EXTRUDING H-P-M extruding presses are used principally to coat welding electrodes.

DEPENDABLE PERFORMANCE
for Reconversion

Specify in your post-war planning the taps with the PROVED War Record . . . a proud record of "impossible" delivery schedules . . . long, accurate runs between grinds . . . minimum down time and rejects. H-W Taps retain precision longer because the "Hanson Process" . . . our exclusive method of finishing after hardening . . . insures uniform grain structure throughout. If you have a tapping problem, write or wire . .

ARMY NAVY

Hanson Whitney

MACHINE COMPANY

HARTFORD • CONNECTICUT

SPEED TREAT PLATE

Is the Basic Tool and Die Room Steel

Note the depth of the cavities in the mold pictured above. *Speed Treat* because of its fine machining qualities is the ideal steel for molds of all types. It responds readily to all heat treatments and withstands constant temperatures up to 700° F. without checking.

The dial of the cupping device shown above is made of 1¼" *Speed Treat* Plate, machined, flame hardened and ground. Here again the fine finish, free machining qualities and heat treatment response of *Speed Treat* Plate are an ideal combination.

Speed Treat X1545 Plate .40/.50 carbon steel combines the four essential qualities of an ideal basic steel, *high tensile strength, free machinability, excellent hardenability and constant uniformity.*

Naturally, it is widely used for metal forming and trimming dies, back-up plates, bolster plates, brake dies, and other metal forming jigs and fixtures—parts which formerly required the physical and hardenability properties of water hardening tool steels.

Speed Treat Plate frequently replaces water hardening tool steels, saving up to 66%. It is preferred in many shops because of its lower cost, because it machines more readily, and because it reacts properly to all standard methods of heat treatment, especially selective surface hardening.

Its use is indicated wherever metal forming dies and fixtures are required for average run applications, where production quantities are below 250,000 to 300,000 pieces.

Use *Speed Treat* Plate in your work now. Learn first-hand of its many advantages for postwar applications. Send for a copy of new Catalog No. 1243.

W. J. HOLLIDAY & CO.

"Established 1856"

Speed Case-Speed Treat Plate Division, Hammond, Indiana

Plants: Hammond and Indianapolis, Indiana

Quality Controlled Speed Case and Speed Treat Steel Is Available In All Common Plate Sizes from these Distributors

Beals, McCarthy & Rogers, Inc., Buffalo, New York
Brown-Wales Company, 493 C. Street, Boston, Mass.
The Burger Iron Company, Akron, Ohio
Grammer, Dempsey & Hudson, Inc. Newark, New Jersey
Earle M. Jorgensen Co., 5311 Clinton Drive, Houston
10510 So. Alameda St., Los Angeles 54, Calif.
1057 22nd St., Oakland 7, Calif.
Peninsular Steel Co., 1030-40 McDougall Ave., Detroit
Horace T. Potts Company, East Erie Ave. & D St., Philadelphia, Pa.
Peckover's Limited, 77 Front Street, E. Toronto, Ont., Canada

TUNES OUT TROUBLE

When slotted screws were used by this musical instrument maker, head breakage and driver skids damaged expensive assemblies – required disassembly, costly refinishing, and reassembly. A shift to Phillips Recessed Head Screws ended this trouble, permitted lower assembly costs.

SWING TO SAVINGS

Because the recessed head makes more efficient use of turning power, Phillips Screws can be set up tighter without danger of burring. As a result, fewer Phillips Screws are needed to make the rigid assembly required – a further saving in time and material.

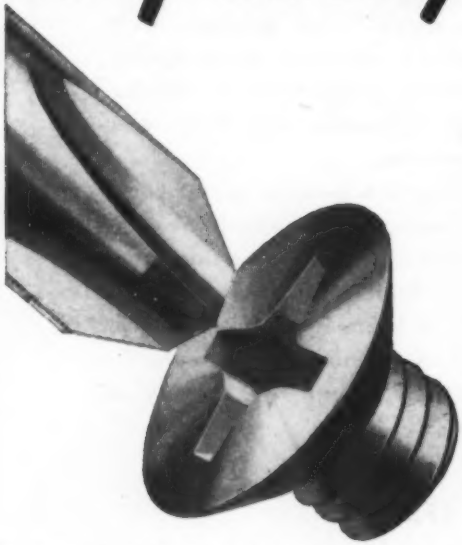
IN TIME WITH TOMORROW

Besides reducing costs and speeding up production, Phillips Screws help designers plan new, simpler methods of achieving strength, rigidity, and improved appearance. Result – a product in step with design trends – and a match for competition in tomorrow's tough markets.

SALES HIT HIGH NOTE

From the sales angle, Phillips Recessed Heads make fastenings a *feature!* No unsightly burrs to cool off prospects! The ornamental pattern of the Phillips Recess blends in harmony with modern design . . . helps start cash registers ringing a sweet sales symphony!

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

This New Name
Vulcanized Rubber and Plastics Company

(formerly The Vulcanized Rubber Company)

means new and improved services for volume users of hard rubber, soft rubber and molded plastic parts and products.

With the expansion of the Plastic Division, our research, engineering and manufacturing facilities are available to help manufacturers and fabricators overcome their experimental and production problems on plastics as well as hard and soft rubber—from selection of the proper material to precise quality control that assures uniform adherence to specifications.

Which is the best material for your part or product?

PLASTICS?
HARD RUBBER?
SOFT RUBBER?
WHAT COMPOUND?

The chemical and physical properties of a material affect a product from design to actual performance. New plastics are constantly emerging. The properties of plastics such as Cellulose Acetates, Acrylics, Phenolics, Polystyrene and Vinyls, for instance, differ a great deal. Research on rubber is continuing and new synthetic rubber formulas are being developed. When natural rubber returns, we will have a greater range of compounds.

The material that is best for your part or product depends on the job it has to do.

Plastics? Fine. But are you sure Hard or Soft Rubber won't do it better?

Just as it made sense for us, with our molding experience, to go into the new plastics, it also made sense to continue our research and fabricating on the older plastics . . . hard and soft rubber. In many applications they work far better than any of the newer plastics, particularly where dimensional stability in the presence of heat, moisture and solvents is a requirement.

A certain type of plastic, or formula of hard or soft rubber; a metal or a combination may be the best answer.

It might pay us both to get together.

We have the chemical and physical research and testing laboratories to help you find the right material. And we have a wealth of experience in fabricating molded forms.

Starting over sixty years ago with hard rubber, one of the first plastics, we have constantly sought to convert any new development in plastics to the mutual benefit of our customers and ourselves. If yours is a volume product or part, chances are that our research assistance and facilities for efficient, large-scale production will fill your needs at reasonable cost.

Just tell us where and how your part or product has to go to work, or give us the specifications. If we should find that the part or product doesn't belong, economically or physically, in any one of the wide range of plastics, hard rubber, soft rubber, or molding methods that we are set up to handle, we will frankly say so and recommend what we think is best.

CHEMICAL RESEARCH AND TESTING. QUALITY CONTROL.

This modern laboratory with complete equipment is at the disposal of our trained staff to help you select the right material and control the quality of your part or product by testing for adherence to specifications in the various phases of production.

PHYSICAL TESTING AND QUALITY CONTROL.

A completely equipped physical testing laboratory checks your product from design to performance requirements. Machinability, tolerances, hardness, dimensional stability and other physical properties are checked for adherence to specifications.

VULCANIZED RUBBER AND PLASTICS COMPANY

formerly . . . The Vulcanized Rubber Company

Manufacturers of Rubber and Molders of Plastics

General Offices: 261 Fifth Avenue, New York 16, New York. Works: Morrisville, Penna.

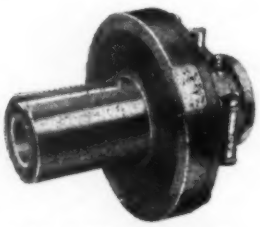
ROLLING GRIP

A GREAT NEW DEVELOPMENT IN FRICTION CLUTCHES

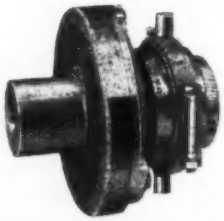
No Toggles! In the Dodge Rolling Grip Clutch, power transmitting pressure is developed by a circle of hardened steel balls. These are forced into a wedge-shaped groove by the sliding cam. The cam and groove contours utilize the basic mechanical principle of the wedge to multiply the force exerted on the shifter collar into a much greater force on the friction disc.

Dodge Rolling Grip Friction Clutch Gear Tooth Mechanism

Dodge Rolling Grip Friction Clutch Bolted Plate Mechansim



Dodge Rolling Grip Friction Clutch With Sleeve

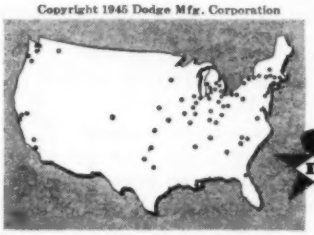


Dodge Rolling Grip Friction Clutch Cut-off Coupling

Another achievement of Dodge Transmissioneering—designed to give outstanding flexibility and ease of control to light machinery, without any sacrifice of positive drive—and available at low cost!

The Dodge Rolling Grip Clutch is especially adapted to bread wrapping, sewing, floor scrubbing, bag making, tobacco, textile, and other such machines. It is rugged, compact, easy to adjust. And it is available from Dodge distributors' stock. Call the Dodge Transmissioneer in your territory for information about this and other new developments in power transmission equipment.

Copyright 1945 Dodge Mfg. Corporation



There are 257 Dodge factory graduate Transmissioneers, located in principal cities, to show you new and better ways of transmitting power.

Sign of the Dodge Transmissioneer

DODGE MANUFACTURING CORPORATION, MISHAWAKA, INDIANA, U. S. A.

DODGE
MISHAWAKA

TRANSMISSIONEERED MEANS ADVANCED DESIGN IN POWER DRIVES

These FREE-MACHINING MONELS

meet your need for strong, tough, rust-proof screw stock

"R" MONEL

...for parts not to be hardened by heat treatment

"R" Monel was developed several years ago as a "special" Monel to be used in making parts on high-speed automatic screw machines. Aside from its easy machinability, "R" Monel has practically the same composition, mechanical properties and corrosion resistance as *regular Monel*. Can be readily fabricated by cold forming. Strength equals that of the best steel screw stock.

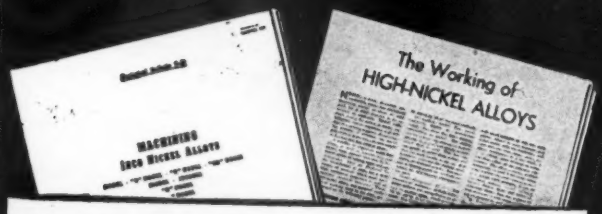
"KR" MONEL

...for parts to be hardened by heat treatment

"KR" MONEL is the *machinable* brother of "K" Monel, long known for its great strength and hardness. It was specially developed for screw machine parts where a *heat-hardenable* material similar to "K" Monel is needed to withstand heavy loads. Corrosion resistant and non-magnetic, "KR" Monel can be made extra hard and strong through heat treatment after machining.

COLD-DRAWN OR HOT-ROLLED
ROUNDS • SQUARES • HEXAGONS

REMEMBER "R" MONEL AND "KR" MONEL —THEIR FREE-MACHINING QUALITIES CAN SAVE YOU TIME AND MONEY



MACHINING TECHNIQUES for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for your copy. Handy, too, is the reprint, "THE WORKING OF HIGH-NICKEL ALLOYS."

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Gentlemen: Please send me
- ☐ a copy of Machining Bulletin T-12
- ☐ a copy of "The Working of High-Nickel Alloys"

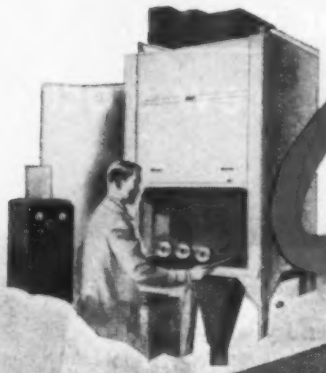
Name .....

Duties ..... *Title* .....

Company ..... A.M. 10-25-45

Address .....

NOTHING LEFT TO *chance!*



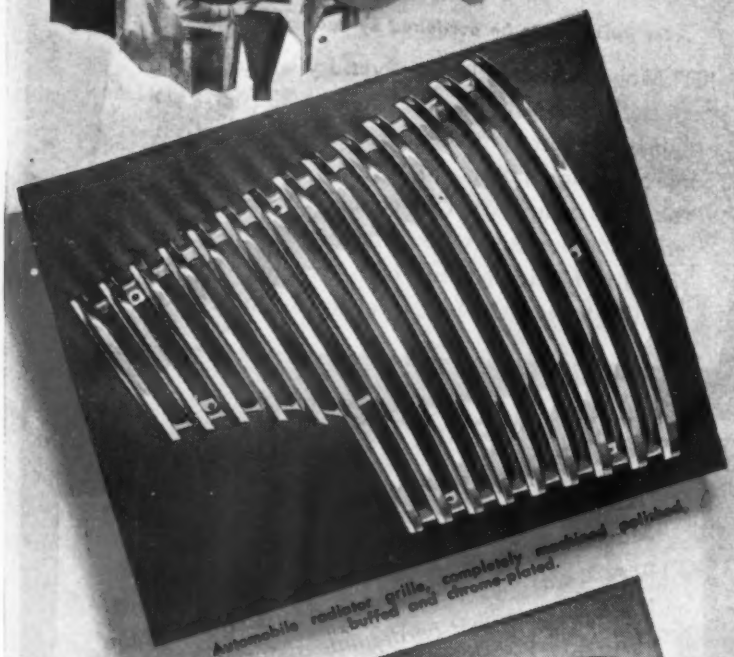
NOTHING is left to chance at the Auto-Lite Die Cast Plant in Woodstock where "Controlled Metals" give die castings strength, accuracy, finish. Auto-Lite's complete testing routines, such as spectographic analysis, metallographic studies, X-ray inspection and stress relieving are constantly on guard against faults and lack of uniformity.

All of these modern inspection processes are available under one big roof, together with the finest equipment for aluminum and zinc die-casting, machining and every type of finishing. For information on how Auto-Lite can help solve your die cast problems write to

THE ELECTRIC AUTO-LITE COMPANY
Die Casting Division
WOODSTOCK, ILLINOIS

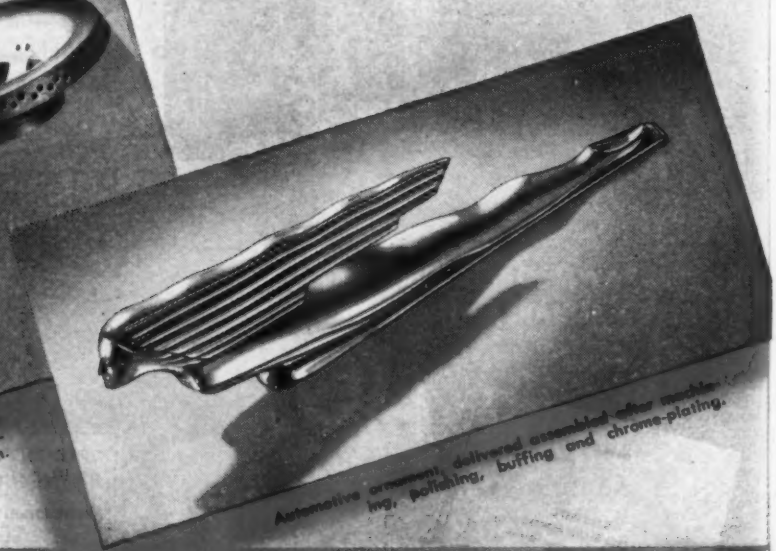
600 S. Michigan Ave.
CHICAGO 5, ILLINOIS

723 New Center Bldg.
DETROIT 2, MICHIGAN



Automobile radiator grille, completely machined, polished, buffed and chrome-plated.

Domestic range gas burners cast of aluminum alloy come in ball-burnish or buffed finish.



Automotive ornament, delivered assembled after machining, polishing, buffing and chrome-plating.

BUY MORE BONDS

AUTO-LITE Die Casting

TUNE IN THE AUTO-LITE RADIO SHOW STARRING DICK HAYMES—SATURDAYS, 8:00 P. M.—E. T. ON CBS

DO YOU MAKE ANY PARTS LIKE THESE?

They are all made from Shelby Seamless Tubing

1. Contact Coupler for searchlight truck
2. Top roller for half-track
3. Bogie wheel hub
4. Impeller
5. Winder cam for textile machine
6. Finished connecting rod bearing
7. Main crank shaft bearing shell
8. Finished crank shaft bearing
9. Spinning ring for rayon machine
10. Finished propeller shaft bearing
11. Steel shell for propeller shaft bearing
12. Finished steel-bronze bearing
13, 14. Clutch-bearing shells
15. Roller for conveyor
16. Spacer for bearings
17. Bearing shell
18. Airplane engine suspension cylinder
19, 20. Finished bearings
21, 22, 23. Cartridge receivers for small arms
24. Airplane engine suspension, steel-rubber-steel
25. Finished clutch bearing

Seamless Steel Tubing will help...

THESE parts have one characteristic in common—they have all been designed to utilize the basic advantages of seamless steel tubing. Many of them were previously made by forging or by machining from solid stock.

Such methods were comparatively slow and wasted a considerable amount of valuable metal. Often the percentage of rejects was alarmingly high.

By skillful redesign, starting with an accurately made seamless tube, production in many cases has been doubled and even tripled. Man and machine time have been cut to the core. Finished parts are more uniform, and, in some cases, rejects have been reduced to zero.

It is easy to see how these faster, better methods will trim off unnecessary costs. Savings as high as 50% are not uncommon.

When you are redesigning your products, let us show you what you can do with SHELBY Seamless Mechanical Tubing to save money, save materials and get a better product. Blueprints or sketches of your design will be carefully examined and suggestions cheerfully made without obligation.

1 *Speed up production*

2 *Make a better product*

3 *Save money, time and steel*

NATIONAL TUBE COMPANY

Pittsburgh, Pa.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

UNITED STATES STEEL

CM METEOR

Here is the Subtractor of Materials Handling Costs

Capacities from ½ ton and up. Lifting speeds from 18 to 60 feet per minute... Low headroom. Hook suspension, plain, geared or motor driven trolley.

CM Bulletin 142 illustrates and describes every operating feature that makes the CM Meteor Heavy Duty Electric Hoist an outstanding production time-saver...cutting deep into materials handling costs. Helical gears, aeroplane cooling, low headroom, safety limit brake, simplified maintenance...these and other advantages are explained in terms of operating efficiency and service life. Various types trolleys and accessory equipment, lift and speed tables, dimensions, etc., are included.

We invite you to write today. Just ask for Bulletin 142.

CHISHOLM-MOORE HOIST CORPORATION

(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 128 Fremont Ave., TONAWANDA, N.Y.

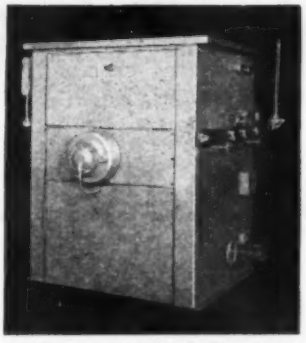
SALES OFFICES: New York, Chicago and Cleveland

THE NEW JLE PNEUMATIC DISK BRAKE

SMOOTH-OPERATING, EASILY ADJUSTABLE, TROUBLE-FREE

FOR USE WHEREVER QUICK, SMOOTH-STOPPING IS REQUIRED

JLE Pneumatic Disk Brake showing simplicity of mounting on any double shaft extension motor or other rotating machinery



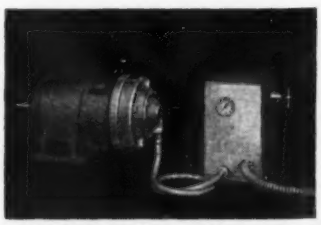
JLE Pneumatic Disk Brake applied to main shaft of Automatic Reeling Unit

SIMPLY CONSTRUCTED, the new JLE Pneumatic Disk Brake is about one-half the size of comparable electrically operated disk brakes, yet has a braking torque four to eight times greater. No lubrication is required on the JLE Brake, maintenance costs are practically nil, and no adjustment is needed during the life of the friction disk. Easily mounted on a motor or rotating shaft extension, the JLE Brake *can be controlled from any electrical or mechanical stop motion device* and requires only 1/40 cu. ft. (or less) of free air per operation. The brake is made in single, double and triple disk sizes, with 100, 200 and 300 lb. ft. torques respectively. JLE Brakes will operate at pressures up to 125 lbs. p. s. i. for use on N. E. M. A. Brake Frame Motors and on any other rotating machinery.

JLE PNEUMATIC DISK BRAKE WITH JLE ADJUSTABLE TORQUE CONTROL UNIT

A compact, high-torque, low-cost control unit designed to permit instantaneous adjustment of braking torque from any remote position without change of brake adjustment.

Send for complete details and specifications to Church St., Pawtucket, R. I.

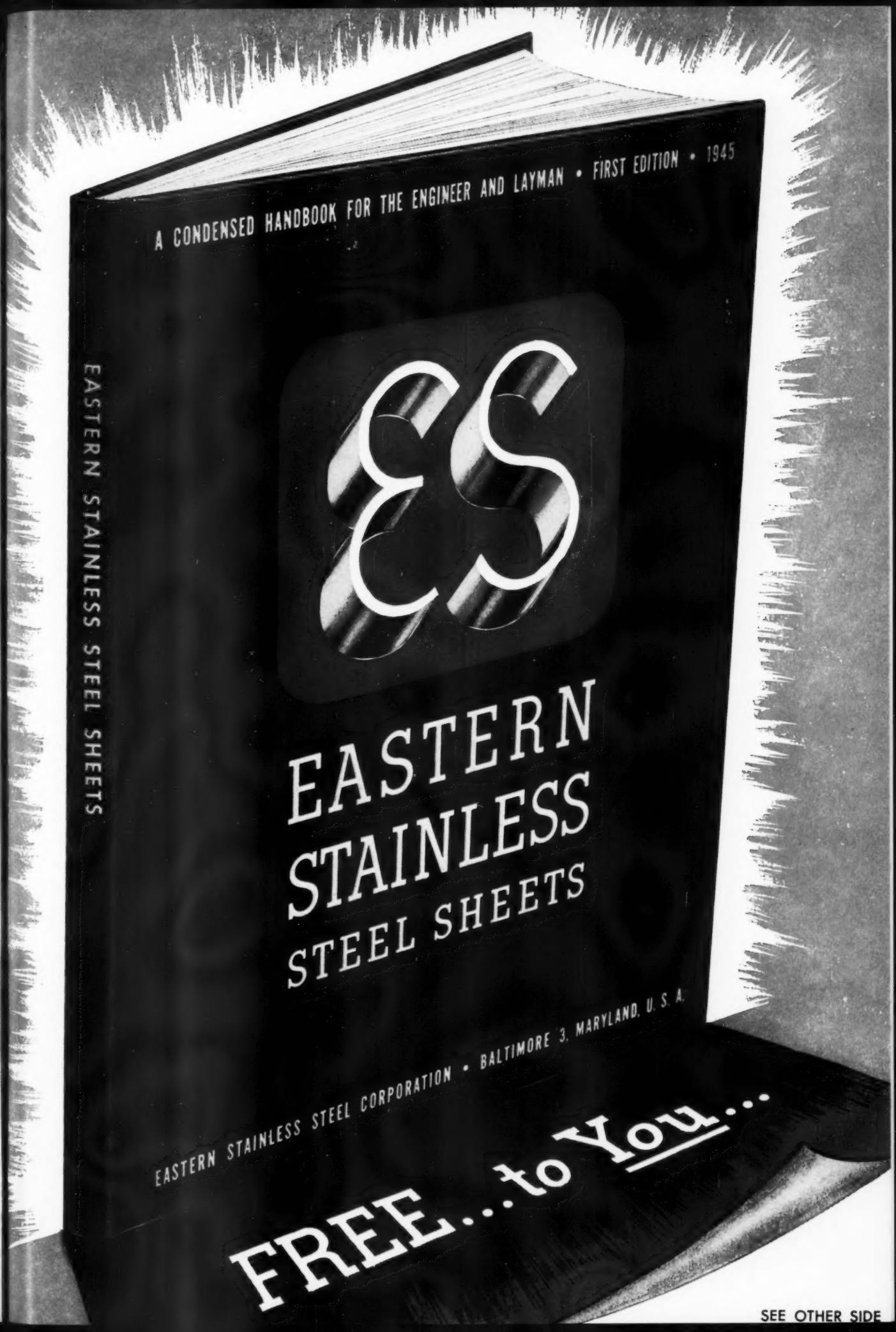


JLE Pneumatic Brake and Torque control unit

JAMES L. ENTWISTLE CO.

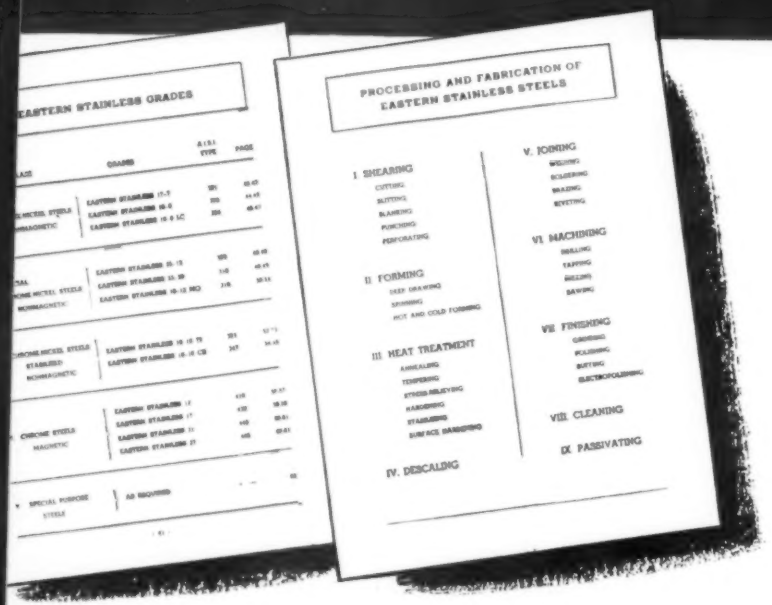
PAWTUCKET, RHODE ISLAND

World's Leading Manufacturer of Spark Testing Equipment


A CONDENSED HANDBOOK FOR THE ENGINEER AND LAYMAN • FIRST EDITION • 1945
ES
EASTERN STAINLESS STEEL SHEETS
EASTERN STAINLESS STEEL SHEETS
EASTERN STAINLESS STEEL CORPORATION • BALTIMORE 3, MARYLAND, U. S. A.
FREE...to You...

SEE OTHER SIDE

NOW— THE NEW HANDBOOK BY EASTERN STAINLESS STEEL



These two sub-indices give you an idea of what it will be worth to you to have this book handy on *your* desk. Have you ever seen any compilation of facts on stainless so *complete*—so *well organized*?

After months of preparation it's now ready — this valuable 96 page Catalog you've been waiting for!

There's not a page that's not *authentic* in EASTERN's handy new "encyclopedia" on Stainless Steels. And no wonder—the book was actually compiled by top stainless steel specialists . . . EASTERN key men who know not only their own jobs but a good many of your problems too! You'll find they've anticipated your questions and arranged the answers so when you want one you don't have to thumb for it!

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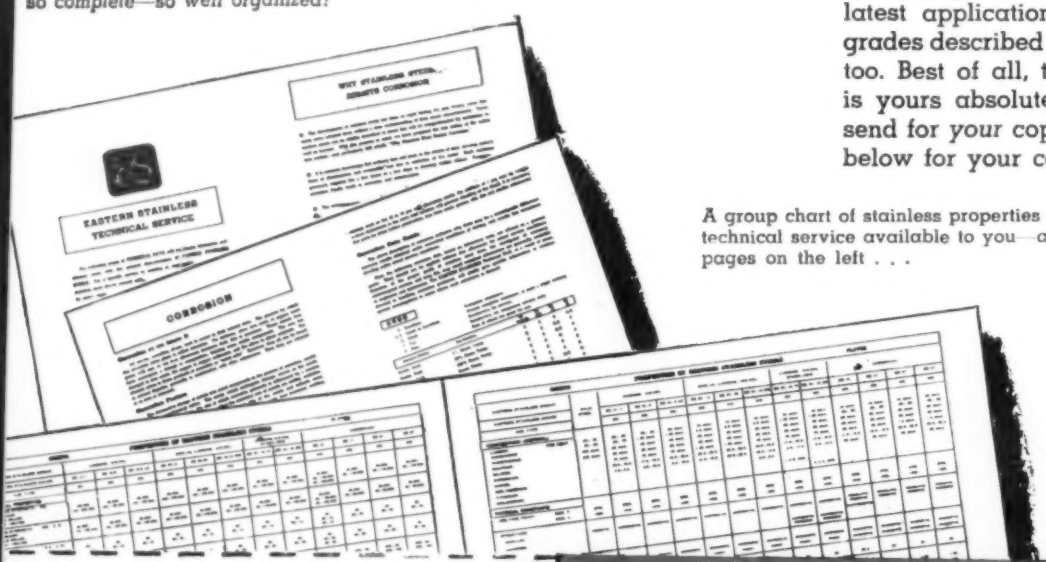

A group chart of stainless properties and notice of a valuable new technical service available to you—*all in one book*. A few sample pages on the left . . .

EASTERN STAINLESS STEEL CORP.
Baltimore 3, Maryland Dept. 75

Gentlemen: Please send me a free copy of your valuable new 96 page catalog.

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ask EASTERN *for the answ*
when STAINLESS *is the ques*

OCTO

WHEN THE TEMPO QUICKENS

At war's end will you be able to keep pace with the quickened tempo of the times? The demand will be for more and better products at lower cost . . . faster and better production.

Wesche engineers are prepared to plan with you now the powering of your products to the faster tempo to come . . . to help you make your products and methods more efficient—more dependable. All Welco Torque Motors are custom-built for a specific job. They make it possible to concentrate a specified amount of power in the smallest possible dimensions . . . enable the machine manufacturer to accomplish operations on his machines in less complicated, less costly and, at the same time, better appearing methods.

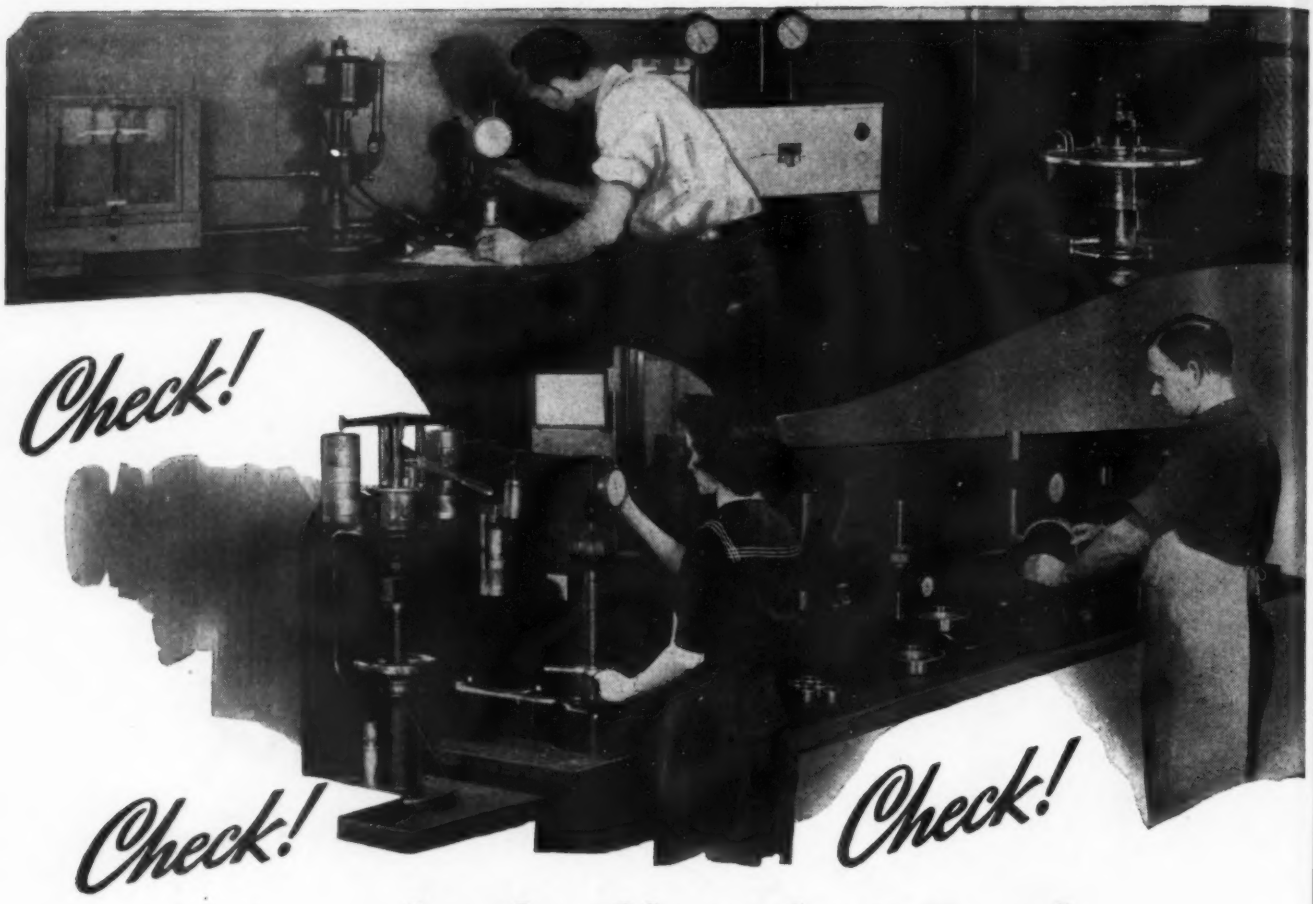
Only Welco Torque Motors have "Uni-frame" construction. This provides for an easy interchange of A.C. and D.C. motors to fit the same housing or frame. Both the A.C. and D.C. motors are built to exert torque up to 4000 inch pounds.

There is no powering problem too difficult for our engineers to solve. They are at your service to help you greet with confidence the day when the tempo quickens.

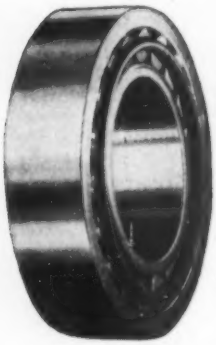
Write today

THE B. A. WESCHE ELECTRIC CO.

1624-5 Vine Street **Cincinnati 10, Ohio**



In the Manufacture of LINK-BELT BEARINGS There are NO "MINOR" DETAILS!



● Few plants manufacturing precision products carry the pursuit of perfection to greater lengths than does the Link-Belt Ball & Roller Bearing Division Plant. Tests for quality of materials, and accuracy of workmanship, by means of the finest instruments and gages obtainable, are made at every stage of operation, by scores of expert inspectors, just as in every plant making precision parts today. Significant of the careful, unsparing scrutiny exercised over *every* factor affecting the manufacture *or use* of these bearings, Link-Belt even tests the grease used to pack them! Note the top illustration on this page. Scientific design, modern equipment and meticulous care in every detail of manufacture assure only highest quality in bearings carrying the Link-Belt name, your assurance of efficiency and long life.

LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in principal cities.

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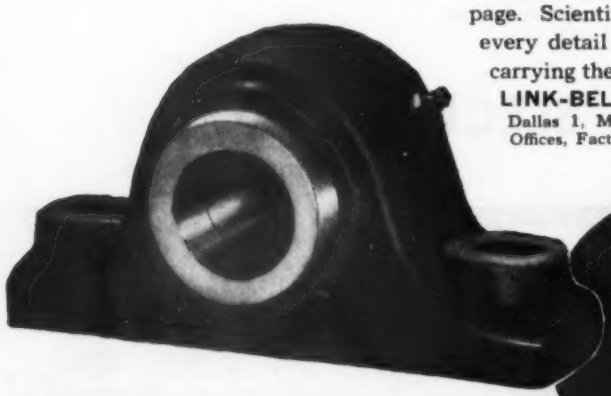
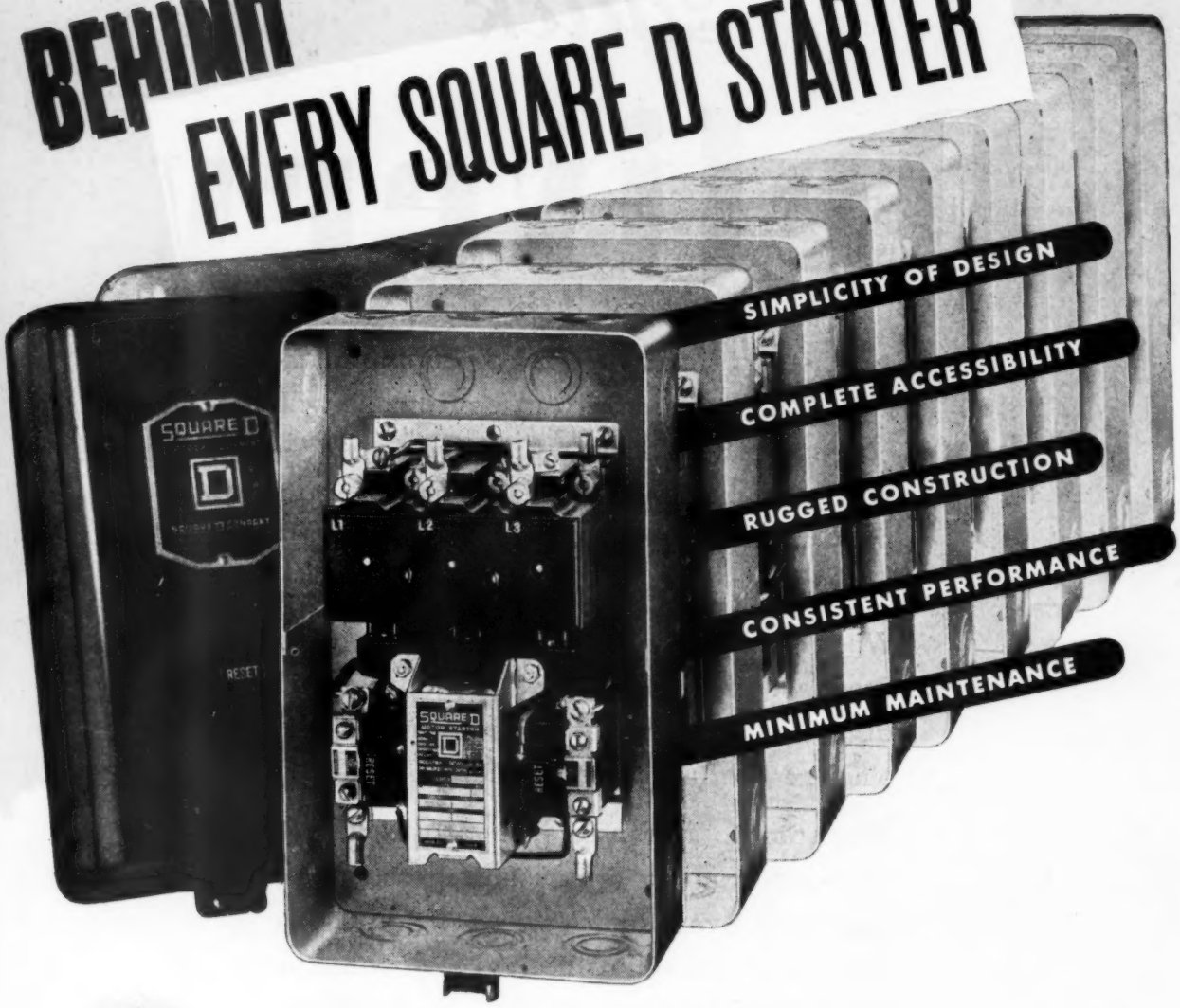


LINK-BELT
BALL AND ROLLER BEARINGS

BEHIND EVERY SQUARE D STARTER



MAGNET coils, contacts or overload relays can be changed in no time at all—and without disturbing external connections. Square D is designed for simplicity.

PLENTY of wiring space and easy-to-get-at terminals. Installation and inspection is faster and easier. Square D is designed for accessibility.

YOU can be sure that any starter from Square D's unusually complete line will do its job consistently and with minimum maintenance. Their performance in thousands of plants proves that Square D starters are built to "take it."

Write for Bulletin 8536

Square D Company, Industrial Controller Division,
4041 North Richards St., Milwaukee 12, Wis.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

Quick
Delivery

● When you reconvert . . . look at your bearings. Your machinery and equipment will have to stand the same terrific strain in peacetime production as it did in war. You can prevent future costly breakdowns and interruptions by installing NEW bearings NOW.

When you install Johnson QUALITY Bearing Bronze you get the highest quality available. You are assured of years of smooth, efficient bearing performance.

We had no reconversion problem. We changed from war production to peacetime operation overnight. Now once again you can secure excellent delivery on Johnson UNIVERSAL Bronze Bearings . . . Electric Motor Bearings . . . General Purpose Bearings. Call in your local Johnson Bronze Distributor for *quick* service on Johnson Quality Bronze.

JOHNSON BRONZE COMPANY
515 S. MILL STREET • • • NEW CASTLE, PA.

FIRST CHOICE OF THE INDUSTRY

HARRIS *Rubber* COMPRESSED BEARINGS AND SHACKLES

Harris **Compressed Rubber Bearings** and **Shackles** are used on practically all cars and trucks manufactured in the United States and Canada.

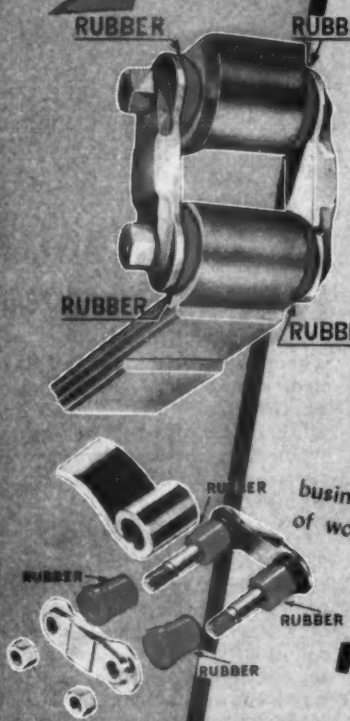
Harris Products Company pioneered in the field of noise and vibration control, designing and manufacturing Harris **Compressed Rubber Bearings** for millions of cars and trucks built in the prewar period, a large percentage of which are still traveling the highways.

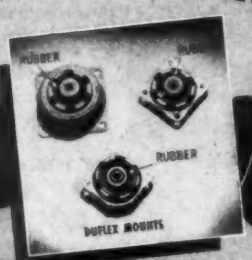
Harris **Compressed Rubber Bearings** and **Shackles** are first choice of industry because they cushion out the shocks and vibrations, thereby giving the vehicle quiet, smooth riding and prolonging its life considerably. Harris **Compressed Rubber Bearings** are used for radius rods, shock absorber links, suspension arms, spring shackles and other pivotal points of the chassis, proving the efficiency and economy of these bearings and clearly establishing their practicability for use for similar applications in other fields.

Harris **Compressed Rubber Bearings** are ideal for most oscillating bearing applications because they require no lubrication, operate noiselessly and without wear and are adapted to take radial, axial and torque loads.

In prewar days and during the war we have solved many problems with Harris **Compressed Rubber Bearings**. Meeting new needs in our field efficiently and economically has been and is our business. If you have a problem our engineers welcome an opportunity of working with your engineers, in its solution. Just drop us a line.

HARRIS PRODUCTS COMPANY
CLEVELAND 4, OHIO





OUT OUR WAY BY J. R. WILLIAMS
WHY, SURE YOU CAN HAVE YOUR JOB BACK, JOHNNY --BUT, WE SURE HATE TO LOSE YOUR WIFE -- SHE'S DONE MIGHTY FINE ON THAT DRILL PRESS!
THE WAR'S OVER FER JOHNNY, BUT LOTS OF HEROES ARE STILL GOIN' TO HAVE SKIRMISHES AT HOME WHEN THEY TRY TO TELL HOW HARD THEY WORKED ALL DAY!
I JIST HOPE IT DON'T GIT TO TH' POINT WHERE THEY ASK US TO STAY HOME AN' DO TH' WASHIN'!
J.R.WILLIAMS
RECONVERSION

V-J Day Didn't Slow-Up the Old Bull

Now that he's helped to polish off the Nips, the Old Bull isn't even taking a breather. He's manning for peacetime contracts just as efficiently as he was for war.

He knows the management is working night and day on projects to provide jobs for our returning fighting men, and for those who so ably manned the home-front.

If you are planning to produce post-war equipment requiring precision parts, we, at Ericsson, have every facility for turning them out promptly, on a low-cost, mass-production basis.

(Below) Some of the many thousands of our precision parts that helped "Keep 'em flying and fighting."

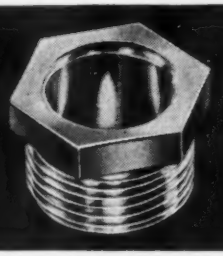
ERICSSON

ESTABLISHED 1911

ERICSSON

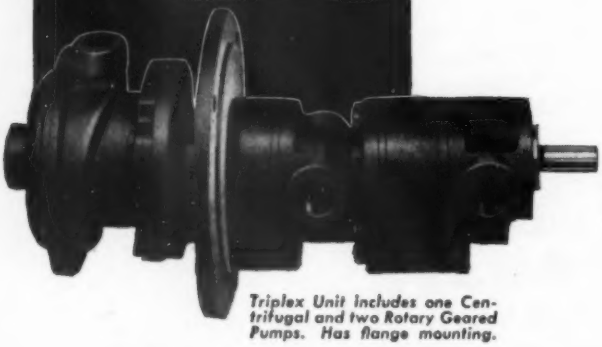
SCREW MACHINE PRODUCTS CO., INC.

25 LAFAYETTE STREET, BROOKLYN 1, N. Y.



You Get all 3—
- Coolant
- Lubrication
- Hydraulic Power

— *from this Special Pump*



Triplex Unit includes one Centrifugal and two Rotary Geared Pumps. Has flange mounting.

The designs of Brown & Sharpe Pumps lend themselves to special combinations and mountings. Geared, Vane, Centrifugal and Motor Driven styles. Catalog on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BROWN & SHARPE PUMPS

Do You Want to EXPORT... *NOW?*

Though shipping space is still limited, export trade is now possible again with 147 foreign countries. Thousands of overseas jobbers, wholesalers and retailers face critical shortages of products which you may wish to export.

Accreylon Company (Export Managers) is handling the export business of many outstanding American firms. Our service relieves our clients of all details—financing, credit responsibility, collections, merchandising, shipping, billing, local laws, tariffs and regulations. Purchases are made for our own account; re-selling abroad is on our own responsibility. We charge no fee.

Accreylon solicits your inquiries, will welcome a description of products for which we may be able to find entirely new markets, through our overseas contacts.

ACCREYLON COMPANY
DEPT. 8-10
130 West 42nd Street
New York 18, N.Y.

The science of vibration control has not been behind other sciences in the advances it has made under the spur of urgency to win the war. Lord Bonded Rubber Mountings solved vibration problems on practically every vehicle of war that sailed the skies, traveled on land or water, or bored the dark caves of the ocean.

All that Lord has learned in a generation of pioneering the field of vibration control, through peace and war, is at the disposal of manufacturers, design engineers, and operation managers, in this new age of faster transport in a travel-minded world.

Lord Vibration Control increases effective power through improved transmission; it prolongs the life of engines and auxiliary equipment. It safeguards delicate instruments upon whose functioning safety depends. It promotes the comfort and efficiency of operators, the relaxation and enjoyment of passengers.

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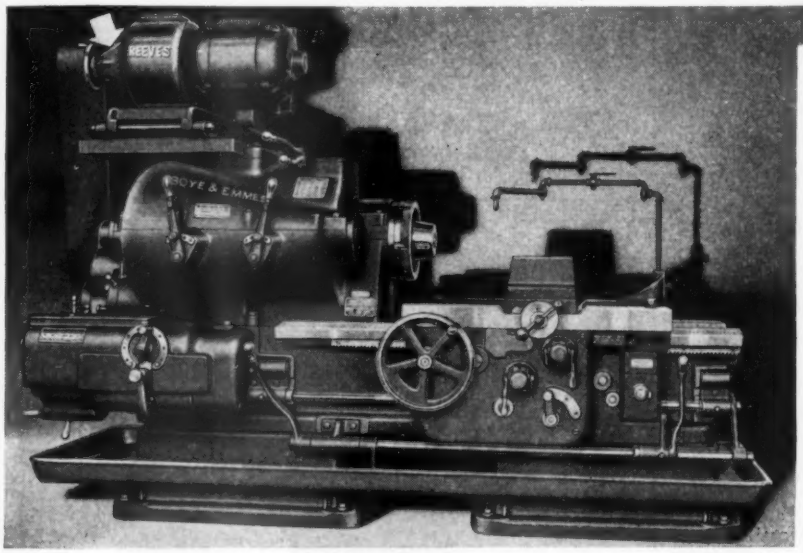

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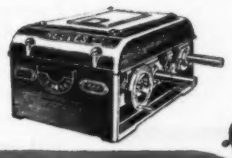

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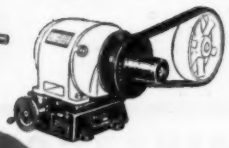

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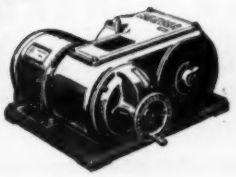

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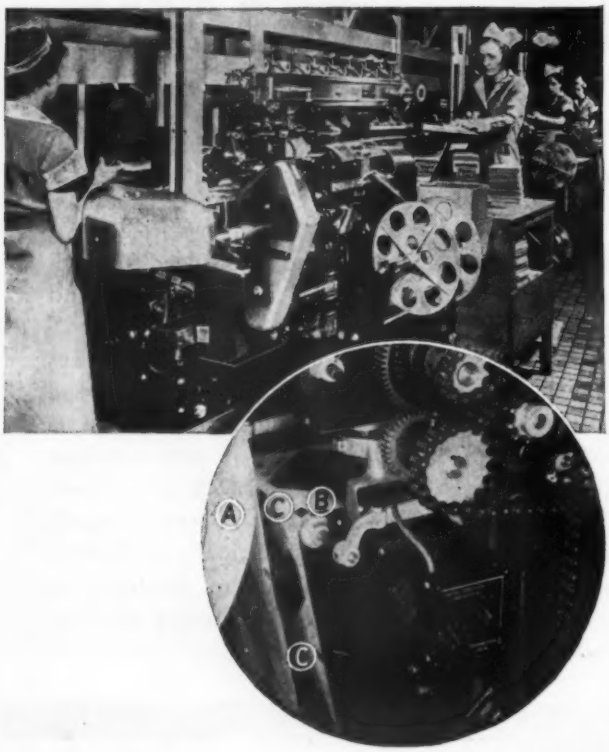

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The quantity production of candy bars requires quick secure wrapping with the label design perfectly centered. The Lynch Manufacturing Corporation of Defiance, Ohio has achieved these desirable results on the Wrap-O-Matic machine, pictured above. The wrappers are web-fed from a roll (A) into the machine at (B). The electric eye markings (C) register under the photo electric cell of the United Cinephone Dual Scanner registration control and actuate the cutting and wrapping mechanism with split-hair accuracy.

This is one of the many practical applications of these United Cinephone Electronic Controls to modern production needs . . .

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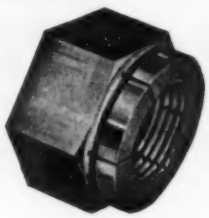

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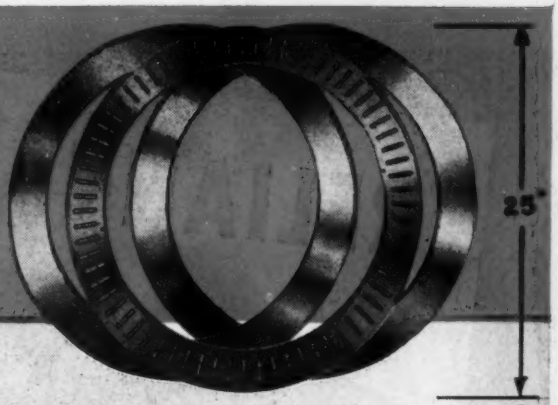

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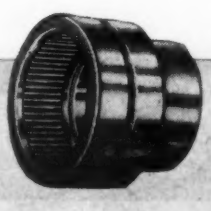

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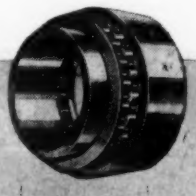

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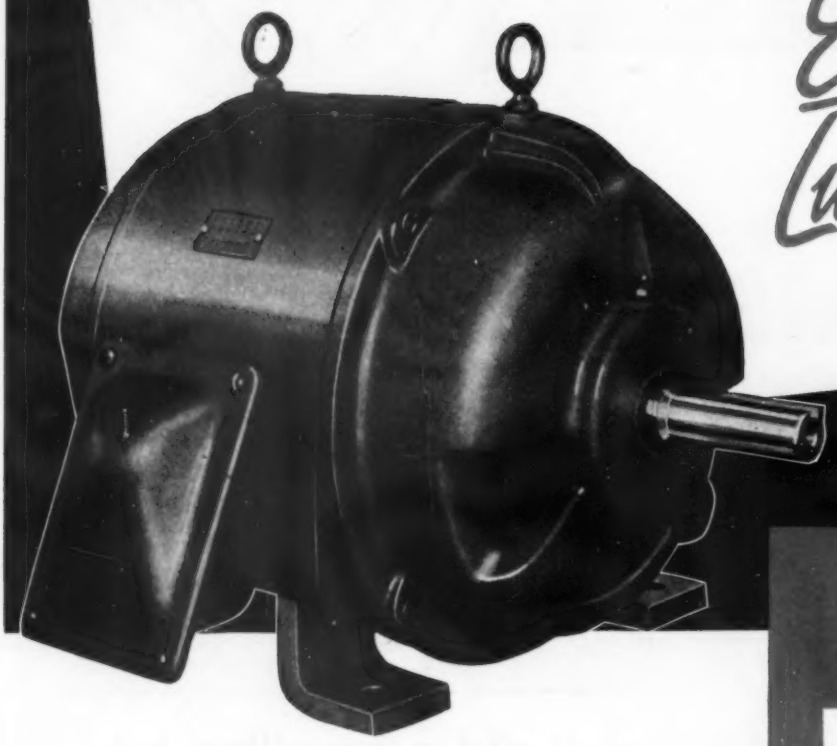

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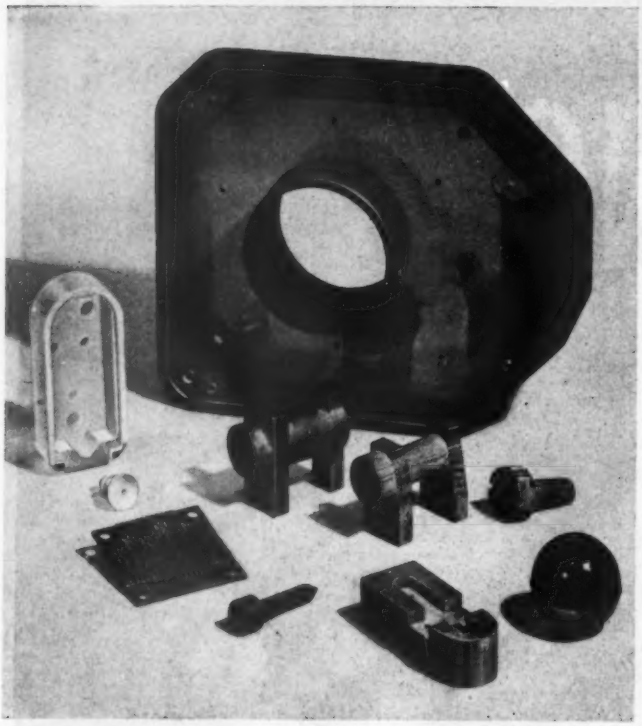

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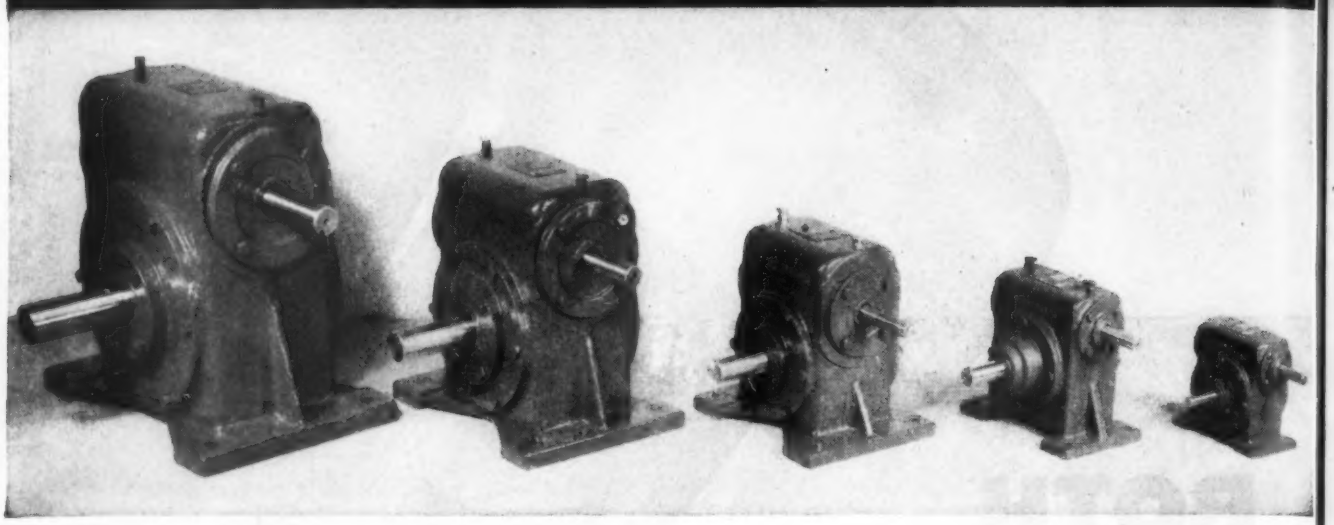

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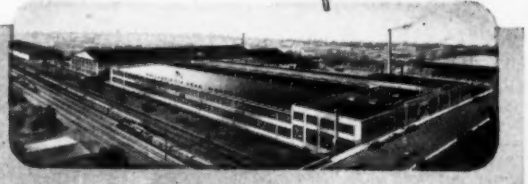
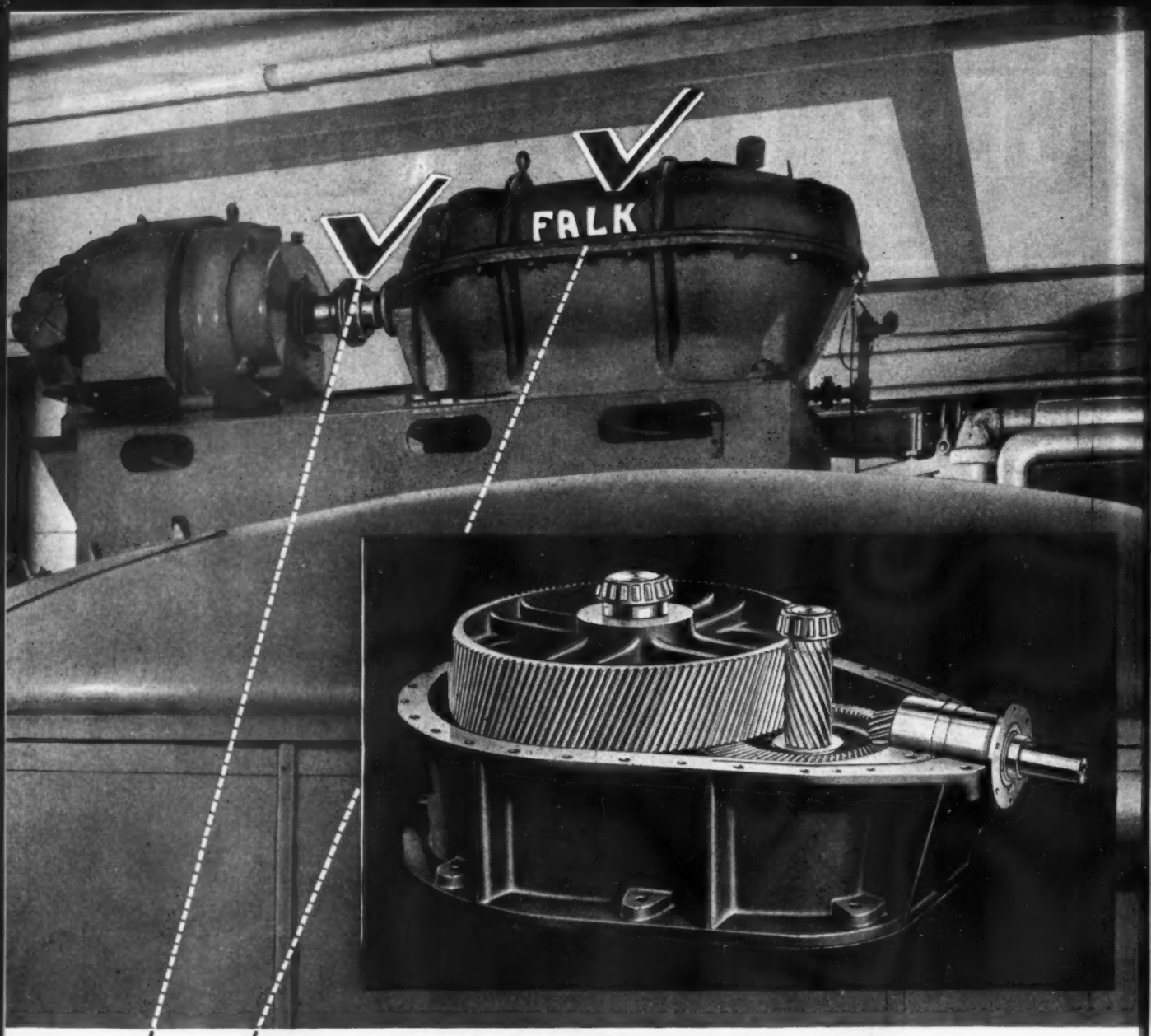


Industrial Gears and Speed Reducers

LimiTorque Valve Controls



This illustration shows a Falk Vertical Right Angle Speed Reducer and a Falk Steelflex Coupling as the power transmitting units operating an agitator drive in a large nationally known brewery. This combination of a Falk Steelflex Coupling and a Falk Speed Reducer is typical of many such installations throughout every industrial field.

Proof by Performance is the Best Proof of Worth

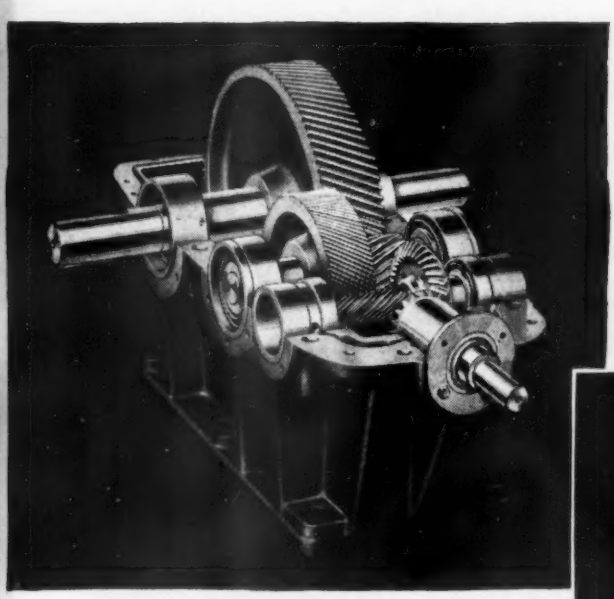
Words at their best can carry only a suggestion of the worth of a product... The final proof of worth—the best proof—is proof by actual performance in the field.

The field performance of Falk Speed Reducers reflects the unusual skills acquired by Falk engineers during their long years of experience in the manufacture of herringbone and single helical gears, and special high speed drives.

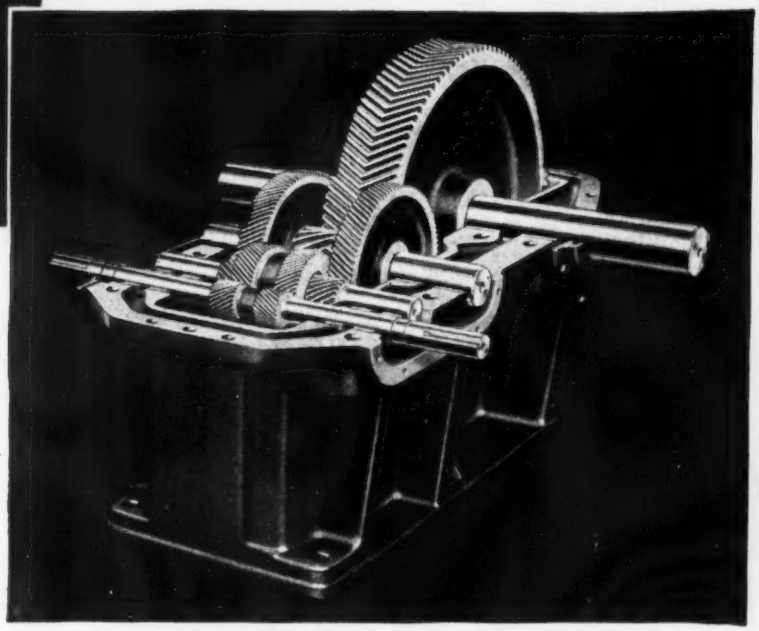
Case histories of Falk Speed Reducer performance in many segments of industry show continuous high efficiency, and extremely long life.

IT ALWAYS PAYS TO CONSULT **FALK**

Any Size... Any Service Requirement can be fully met with Falk Speed Reducers



Falk Speed Reducers are available in single, double, and triple reduction; in parallel shaft, horizontal right angle and vertical right angle types; in ranges from 0.13 H.P. to 2000 H.P.; in ratios from 1.5:1 to 5.28:1 to 52:1 to 515:1 . . . Available with either sleeve or roller bearings . . . All Falk Speed Reducers have a 100% excess capacity and peak efficiencies from 96% to 98½% depending upon the reduction . . . Symmetrical arrangement assures balanced performance . . . Patented system of lubrication and interchangeability of parts assure long life.



Left: Right angle Falk Speed Reducer with vertical low speed shaft. Available in single reduction units, 1.5:1 to 5.28:1; double reduction, 5.7:1 to 43.5:1; triple reduction, 52.1:1 to 430:1.

Above: Right angle speed reducer. Available in single reduction units, 1.15:1 to 5.28:1; double reduction, 5.7:1 to 52.1:1; triple reduction, 56:1 to 515:1.

Right: Parallel shaft, herringbone speed reducer. Ratios: single reduction, 1.5:1 to 10:1; double reduction, 11.5:1 to 70.2:1; triple reduction, 80:1 to 300:1.

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For over fifty years precision manufacturers of Speed Reducers . . . Motoreducers . . . Flexible Couplings . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Contract Welding and Machine Work • District Offices, Representatives, or Distributors in principal cities.

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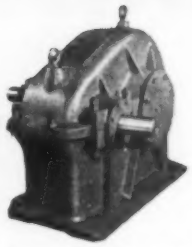
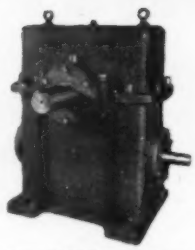


Continuous-Tooth Herringbone Gear Speed Reducers



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Motorized Planetary Gear Speed Reducers

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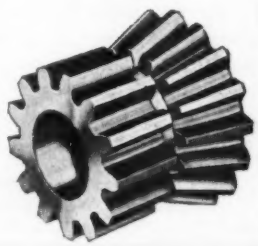

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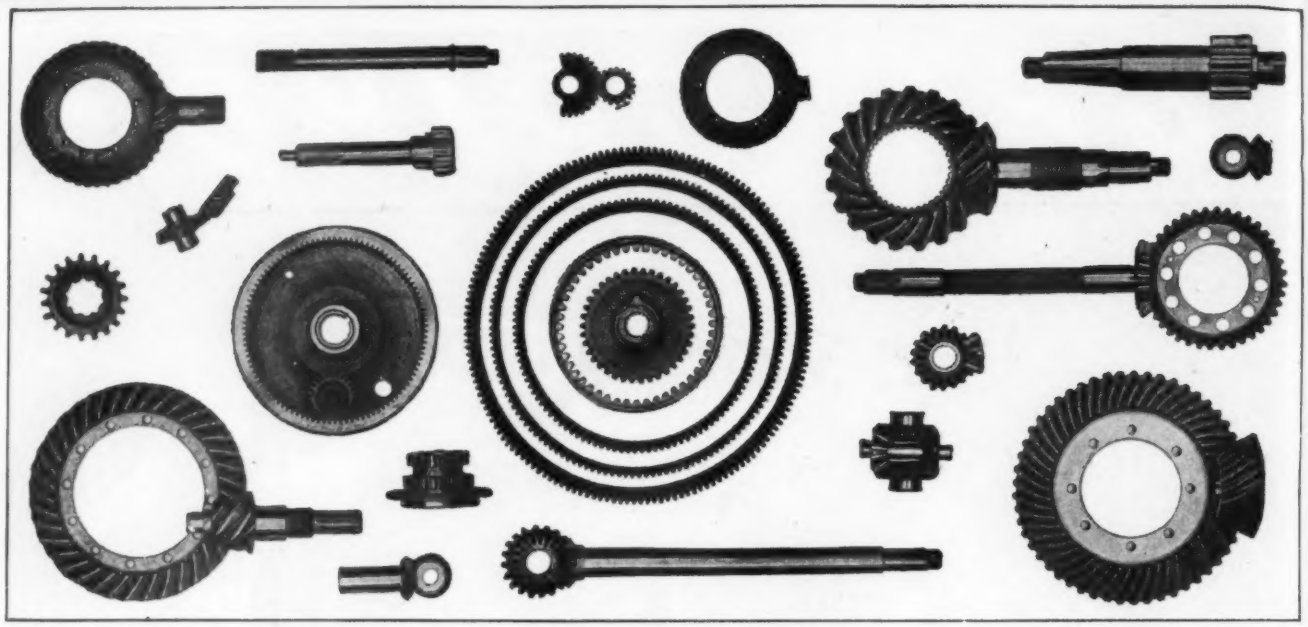

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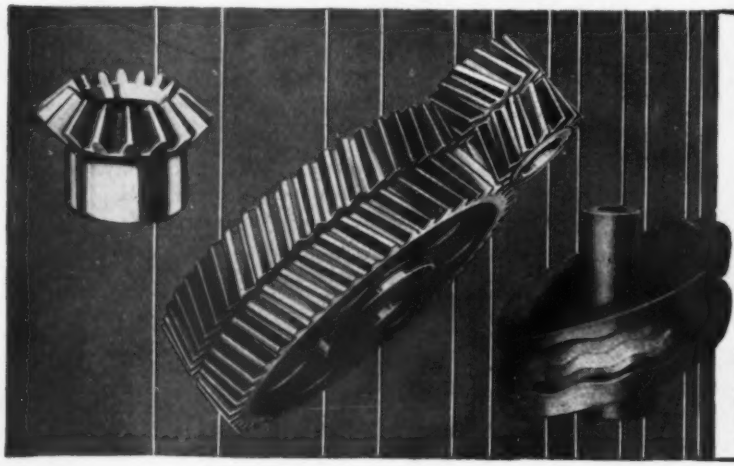

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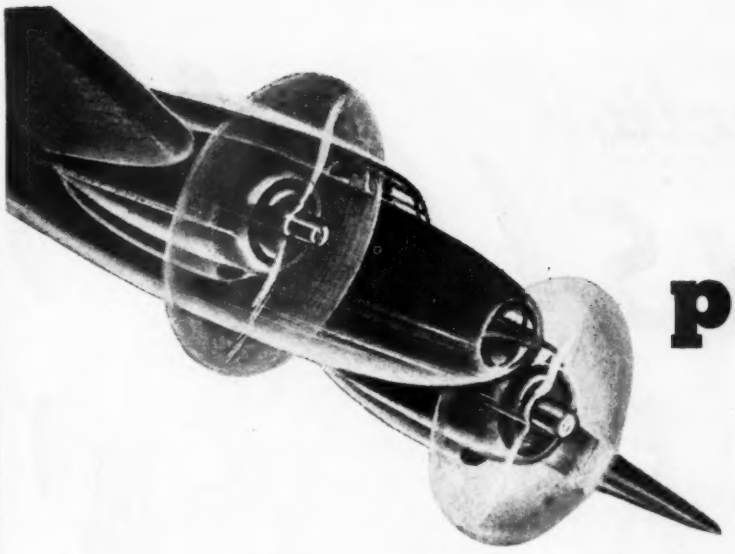
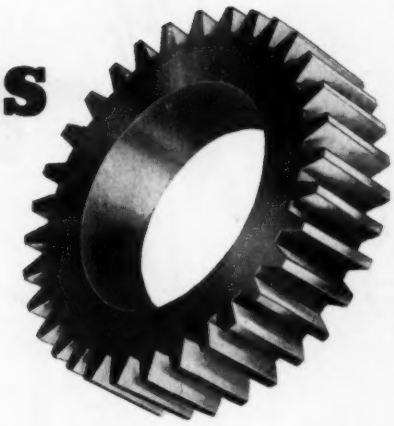


plus



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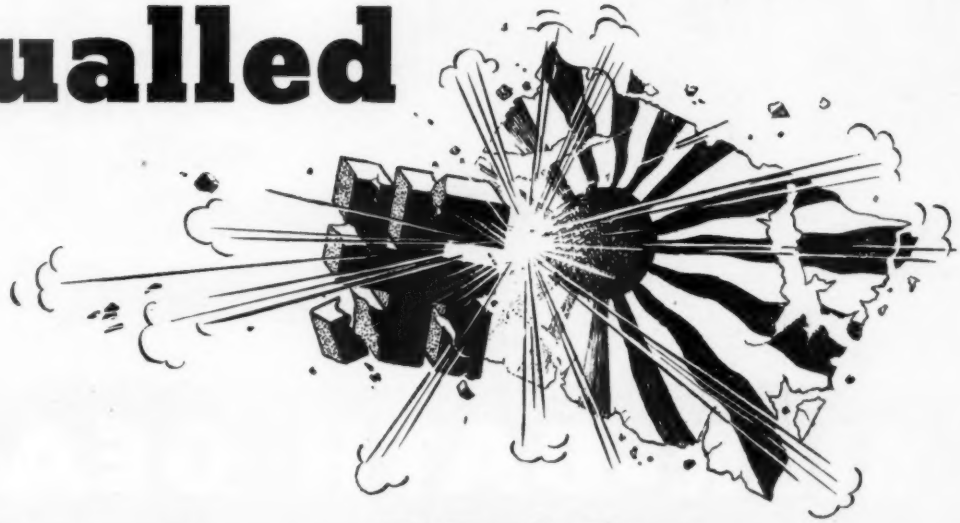

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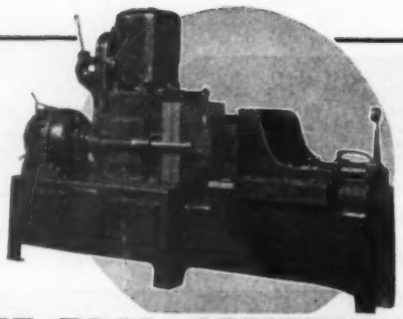

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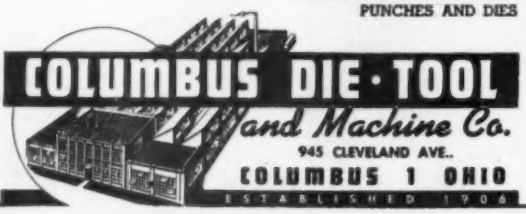

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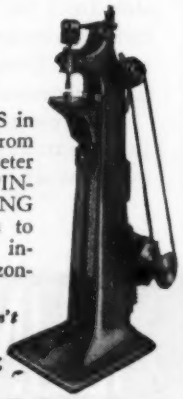

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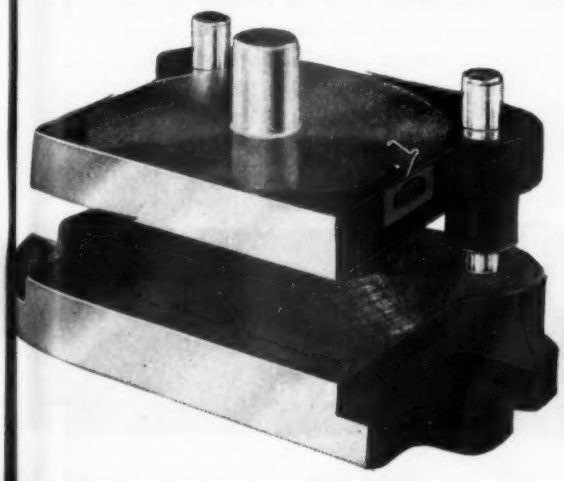

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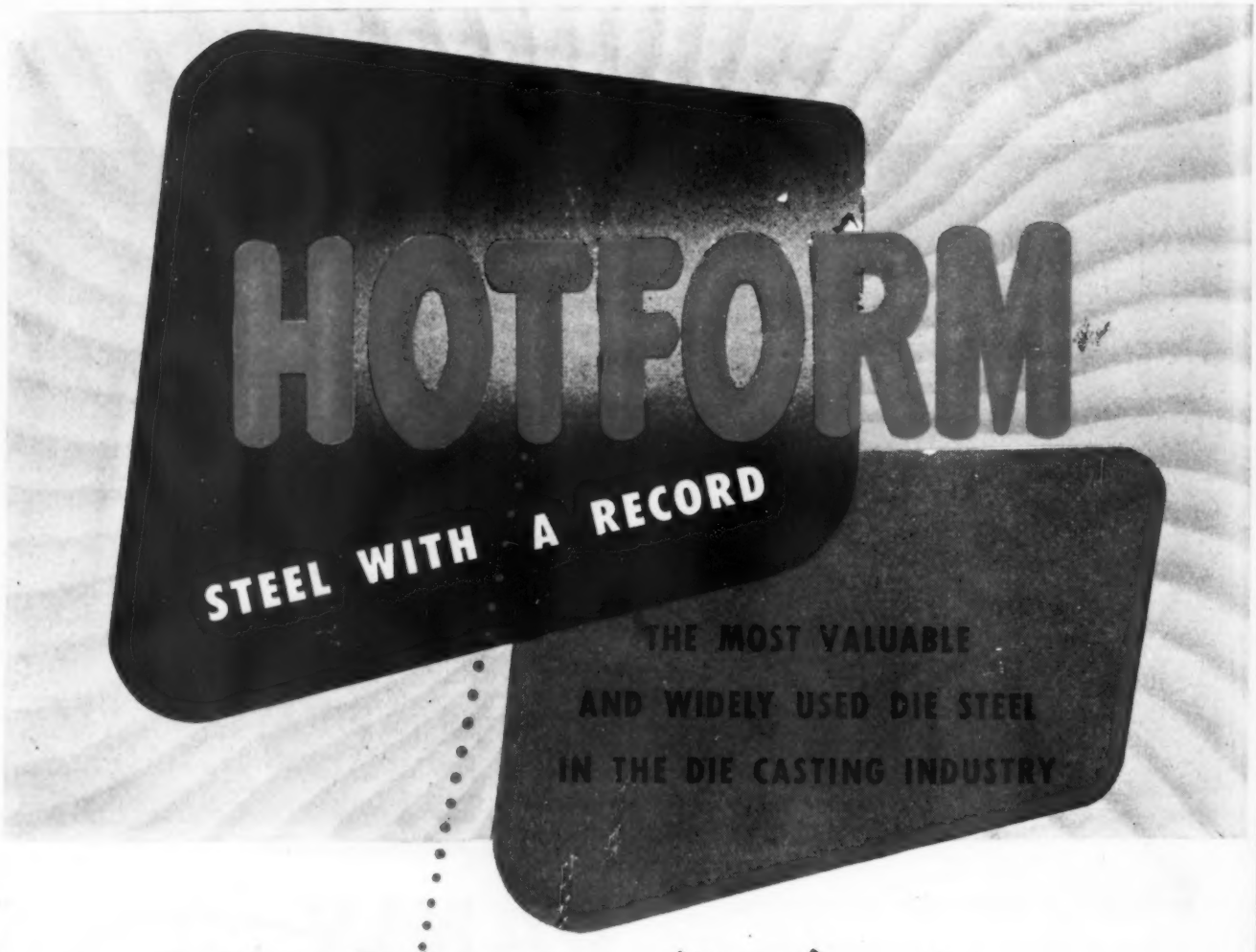

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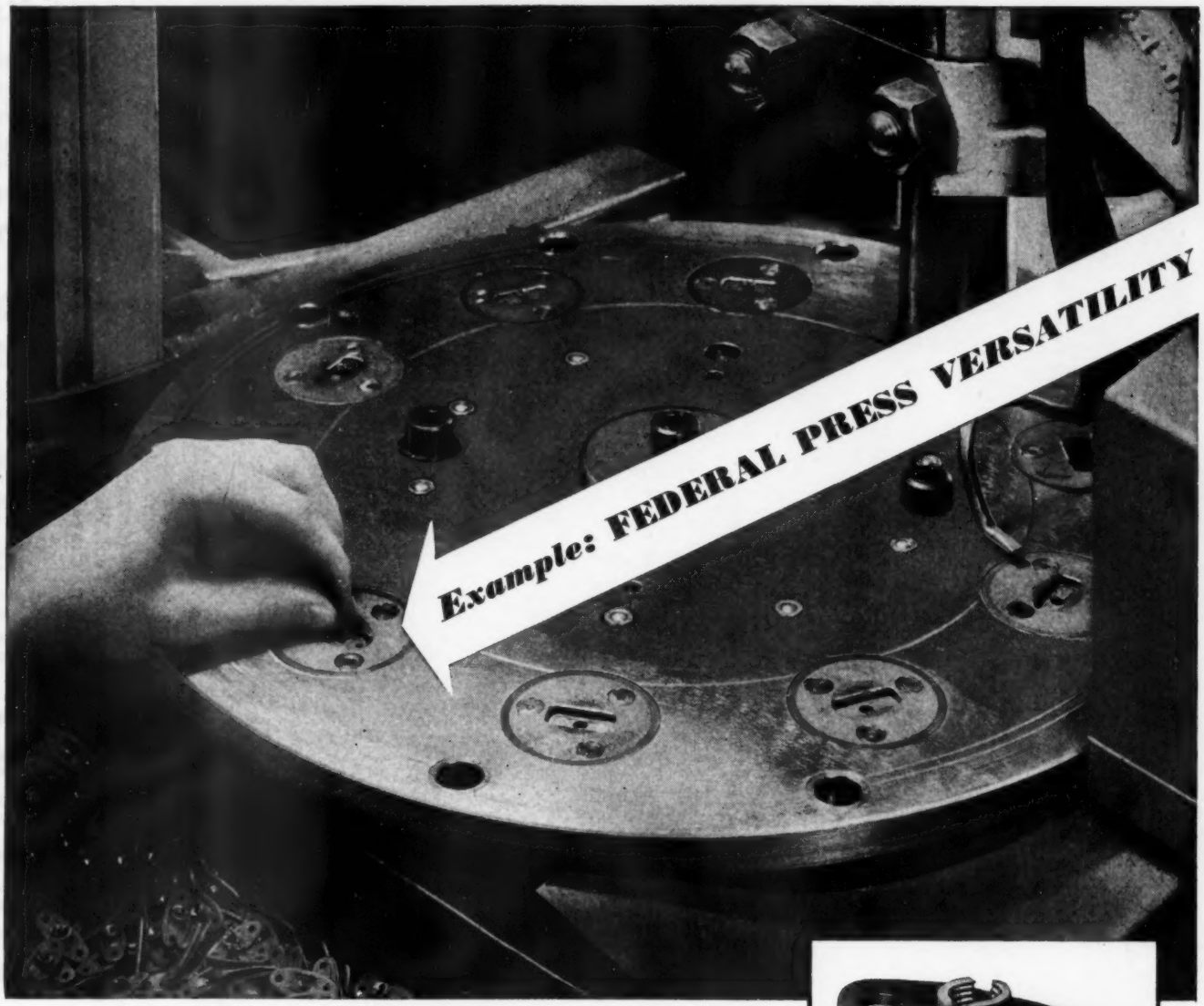

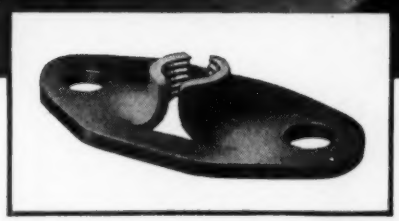

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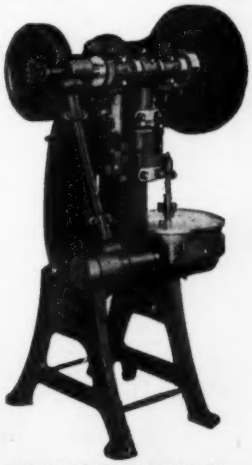

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Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory re-grinding service by the same skilled men who grind new Niagara knives.

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BUY UNITED STATES VICTORY BONDS AND STAMPS

Diagram of positioning buttons formed on the flanges. The punch side was made larger than the die side so that the metal would not pierce.

Redesign for Stamping Cuts Housing Weight in Half

Castings formerly used for these counting device housings weighed 3 lbs. 4 oz. each. The stamped redesign is only about half of this weight. The whole job could not be stamped, so a screw machine part was attached to one half through a "D" hole. To permit assembly of an oil cup, this same half had a hole pierced in it and was then extruded to permit assembly of an oil cup. This method saved making the parts of a heavy gauge material throughout. The design was also worked out so that one set of tools made both halves. This is another example of a stamping user saving money through Presteel ingenuity. We invite you to talk over your problems of design or production with our engineers or representatives.

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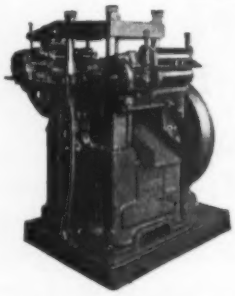
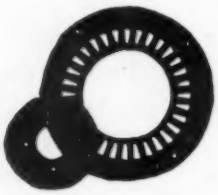
Savings of 60% to 90% of stamping production costs are not unusual after installing the Dieing Machine. This unique press was designed from the ground up for automatic operation using progressive dies. It introduced our improved roll feed which, with various other original features, enables the machine to turn out one to twenty COMPLETED stampings per stroke at speeds up to 300 s.p.m. Five to ten conventional presses and operators are replaced by one Dieing Machine. Intricate parts are readily made complete per stroke, with precision of product within .0002" limits as required. The useful life of dies is generally increased 600% to 1200%. While your new stampings are still in the planning stage invite one of our engineers to make suggestions for COMPLETE-PER-STROKE dies and equipment.

Can opener blade, requiring operations including sunken lettering and beveled blade, produced complete per stroke on Dieing Machine at greatly increased rate.



50-TON DIEING MACHINE
Other capacities: 10 tons to 300 tons.

Eight operations performed at every stroke convert flat material into completed shells at high production. .050" steel with 1¾" draw.



Motor rotor and stator laminations produced simultaneously from same strip of .025" silicon steel.

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Henry & Wright Dieing Machines

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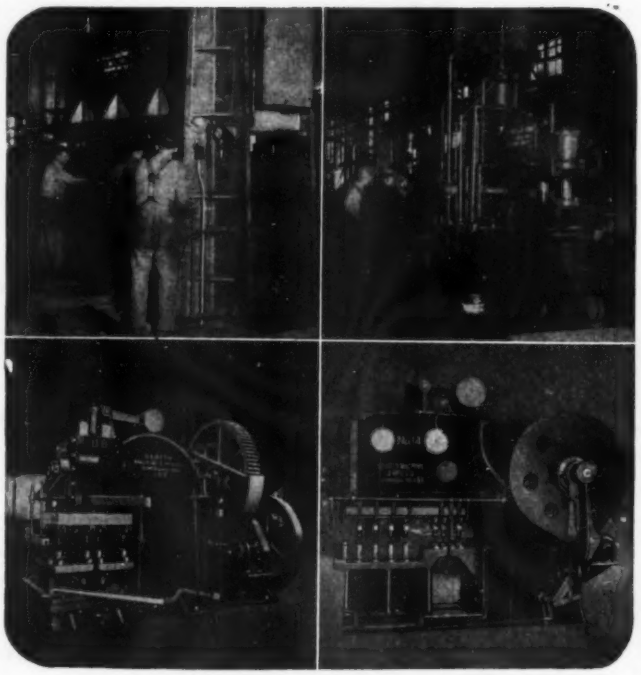


Representative units from the complete BEATTY line of heavy duty punches, presses, shears, coping machines, benders and bulldozers.

BEATTY MACHINE & MFG. COMPANY HAMMOND INDIANA

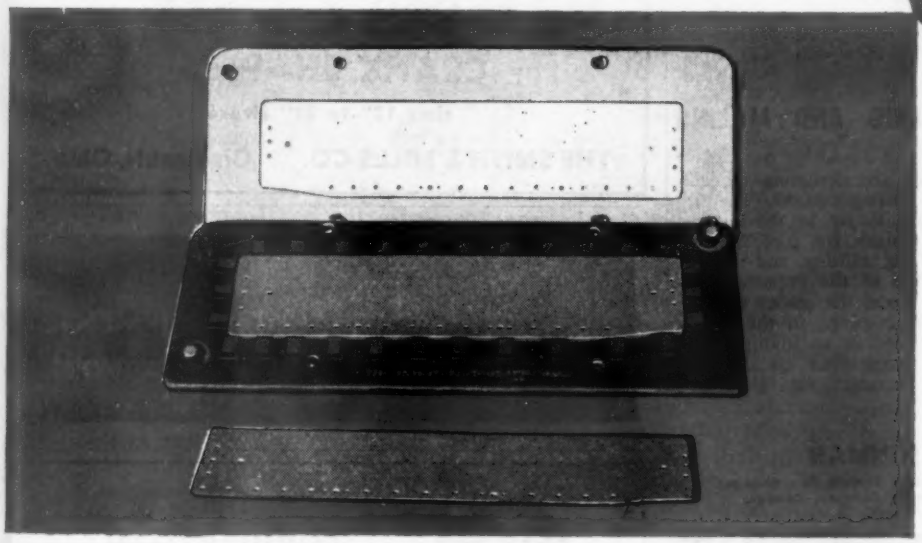
A PRODUCTION "Touchdown" EVERY TIME!

WITH ALGOMA TEMPLATE DIES

SPEED...SPEED...and MORE SPEED . . . that's what wins in football or in PRODUCTION TECHNIQUES. With Algoma Templates you get speed . . . you get into production in ½ the time—at ⅓ the cost. Fast . . . economical . . . production touchdowns are yours with Algoma Template Dies.

Let ALGOMA TEMPLATES show you the way to GREATER PROFITS with FASTER production changeovers.

Tell us . . . the metal . . .the gauge . . . the size of the run . . . we'll quote quickly.



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Did you ever hear of a transmission going haywire on a TANNEWITZ DI-SAW? No, neither did we, though we have been making die saws for a good many years. And that's just typical of the superior construction of the entire machine. It can take the severest kind of use and always be ready for the next job. Moreover the standard model has larger wheels than customary in machines of this type — a full 24 inches — for greater traction, straighter, faster sawing and more production. Get the complete facts and you'll discover why TANNEWITZ DI-SAWS always show the best possible return on an investment in equipment of this kind. Write for "DI-SAW" Bulletin.

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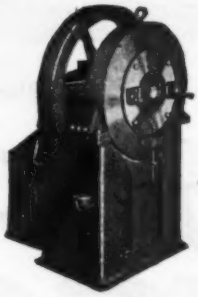

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— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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The 4-Ton Production Giant in Midget Form

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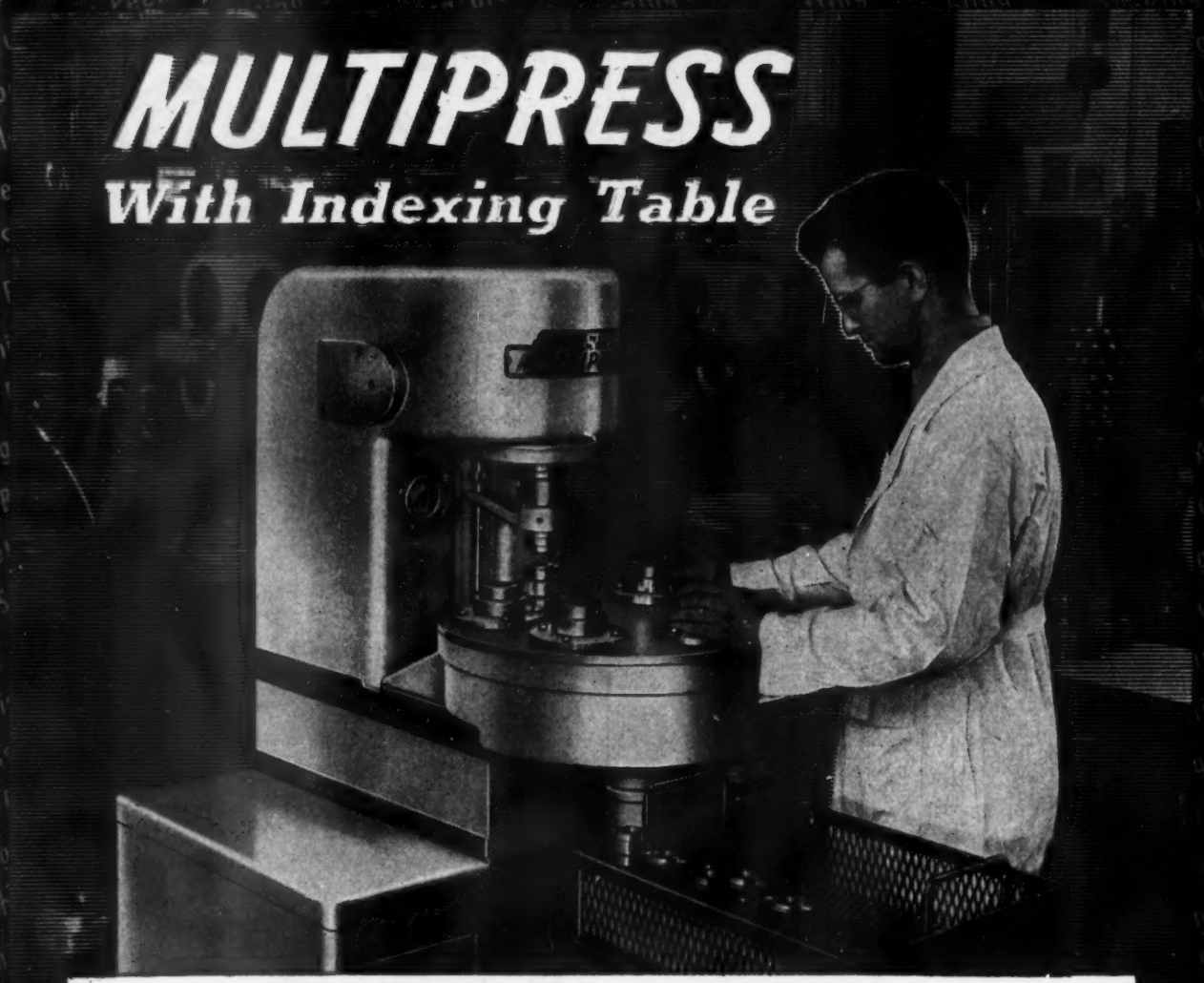
With Indexing Table



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Here's the way to increase production of small parts—at low cost—and with precision.

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Multipress is a fully self-contained, motor-driven, oil-hydraulic machine tool—an easily portable unit, delivered ready to connect to your electric power source. The basic unit (as shown below) is only 16 inches wide, 26 inches deep, and 34 inches high. Its rugged frame, already drilled and tapped for attaching the index table, also provides for the addition of many other standard accessories. Among these are benches, extension tables, side shelves, a variety of bolster plates, straightening fixtures, automatic cycling controls, ram speed controls, and Vibra-Pres control which affords any number of short, exact-pressure, repeat strokes upon each full downstroke of the ram—the number of those strokes regulatory from a few to practically vibration.

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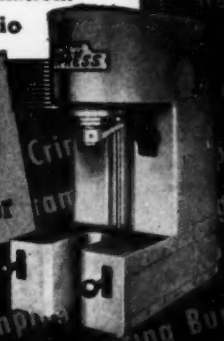

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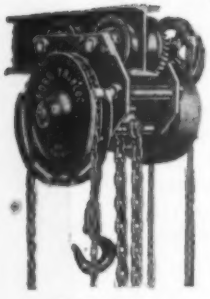
TRIBLOC Quality spur-gear, ball-bearing hoist. Made throughout of high-grade drop-forgings and malleable castings of certified grade. Low in both first-cost and maintenance expense.

IMPROVED SCREW HOIST This sturdy, dependable hoist was designed primarily for use where it is necessary to have a portable hoist. It is extremely useful for riggers, general repair men, or in foundries where especially smooth operation is required.

PORT-O-BLOC This FORD hoist is patterned after the differential type but is made much more efficient through the introduction of ball bearings at axial points.

DIFFERENTIAL Here is the simplest construction of all hand hoists. It has the advantages of light weight, portability, and low price.



ARMY TYPE PLAIN OR GEARED

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For extended hand wheel hoists, chain winches, jib cranes, or complete hoist units, your distributor is the man to see. Send today for specification bulletin on **FORD HOISTING EQUIPMENT.**

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Fits any ¼" electric drill, air drill or flexible shaft.

Speedy! Accurate! Powerful! Saws and files metals, woods, plastics. Chucks in drill chuck or collet. Uses ordinary hack saw blades and standard ¼" shank machine files. Easily used in difficult places.

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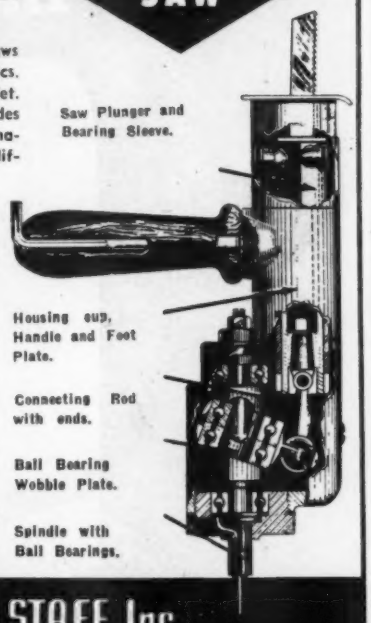
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With Turco's Hand Cleaner

Handisan cuts grease, grime, stains—yet is milder than many toilet soaps

Because Turco Handisan is completely soluble it cannot form wasteful lumps to clog dispensers and stop up drains. It is an ideal mechanic's soap so gentle that it actually soothes bruised, chapped hands, yet so effective that it quickly removes grease, grime, ink and stains. It will not chap hands. Mildly but effectively antiseptic.

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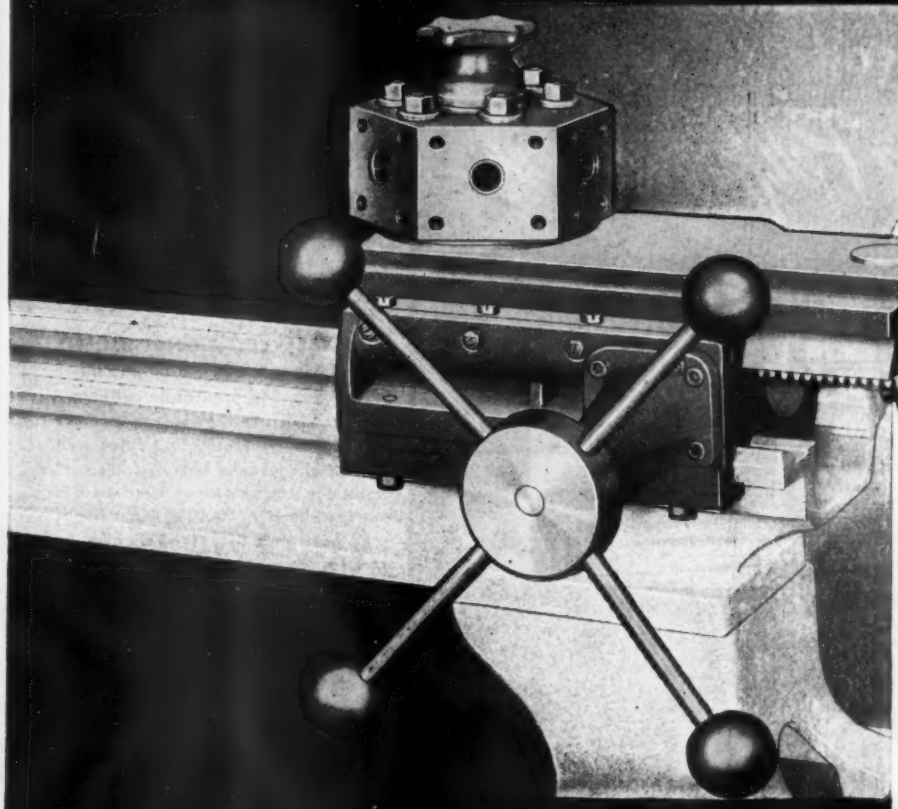
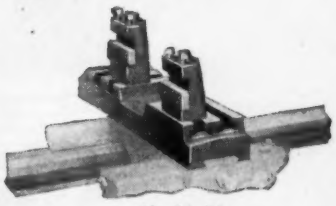
Logan A NAME TO REMEMBER WHEN YOU THINK OF **BETTER** LATHES



NEW TURRET ASSEMBLY

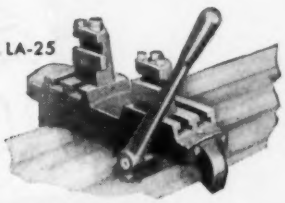
BUILT BY *Logan* FOR *Logan* LATHES

Heavier, More Versatile, More Accurate, Easier to Handle



No. LA-29

No. LA-25



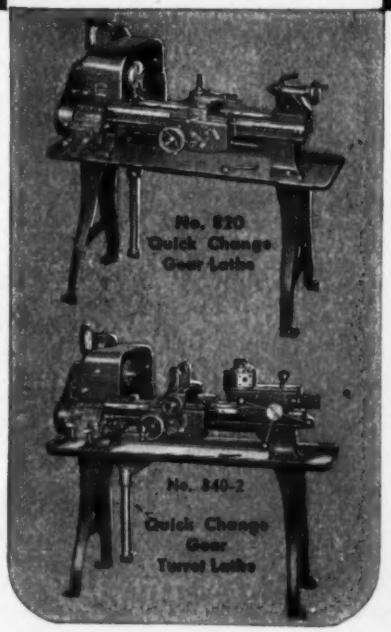
DOUBLE TOOL POST CROSS SLIDES

For use in connection with the Turret Assembly. No. LA-29 is interchangeable with the Compound Rest. No. LA-25 also fits the bed of all Logan Lathes.

THE new Logan Turret Assembly is now standard equipment on Logan Turret Lathes, and is also available as a separate assembly. Designed by Logan for Logan Lathes, this assembly is interchangeable with the tailstock, providing an efficient, economical means of converting a Logan Screw Cutting Lathe for turret lathe production. Built to Logan standards of precision workmanship, and heavier in its overall construction, this new Logan Turret Assembly assures smoother and more accurate cutting with longer tool life. Its hexagonal block design permits mounting tools on face of block as well as in standard bored holes, thus providing more versatility in operation. Pilot wheel operation permits easier and more positive control of the cutting tool. The turret lock insures greater rigidity and increased accuracy, especially on heavier cuts. The assembly is furnished rough bored for either 5/8" or 3/4" finish bore turret holes. It is also available with a lever operated turret for more rapid action on light work.

BRIEF SPECIFICATIONS... Distance across turret head flats, 5¼"... Center of tool holes to top of slide 1 1/16"... Six positions with adjustable stops... self-indexing... maximum stroke of turret 4¼" adjustable gibs on slide.

G-1



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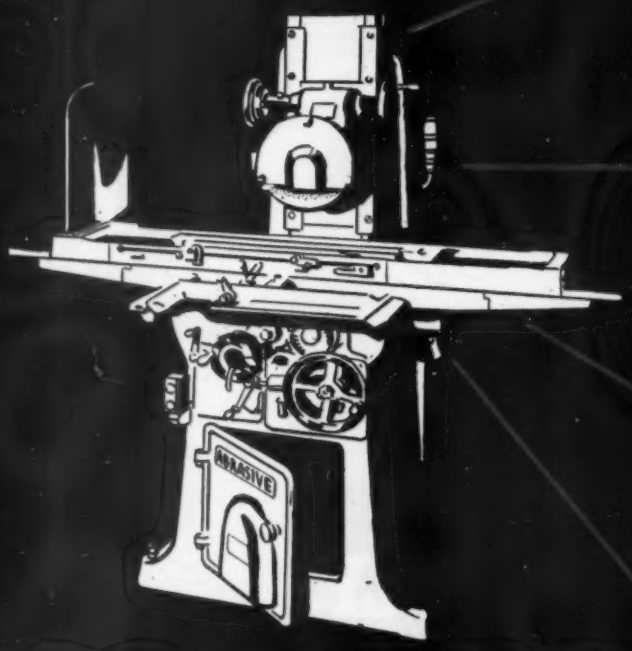

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Wherever accuracy, smooth finish and high production are essential, the 3-B gives outstanding service. Simple in design and with wholly automatic feeds . . . both longitudinal and transverse . . . this reliable ABRASIVE Grinder meets exacting production schedules year after year.

Capacity: Longitudinal, 24" with total movement of 26"; Transverse, 8" with total movement of 8½"; Vertical, 12" with total movement of 12½".

AVAILABLE FOR IMMEDIATE DELIVERY · Send for Descriptive Bulletin

ABRASIVE MACHINE TOOL CO., EAST PROVIDENCE 14, R. I.

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ABRASIVE

ACCURACY BOOSTS PRODUCTION

ONE-PIECE BED

One-piece casting rigidly designed with heavy ribs inside base, weighs approximately 1600 lbs. Assures perfect alignment and extreme accuracy.

MASSIVELY CONSTRUCTED HEAD — Suspended on ball thrust bearing and accurately cut, acme threaded screw, Wheelhead weighs approximately 180 lbs. Fitted with interchangeable, heavy spindle cartridge. Left elevating handwheel is graduated to .0001". Right handwheel gives 3 to 1 acceleration to movement of the Wheelhead.

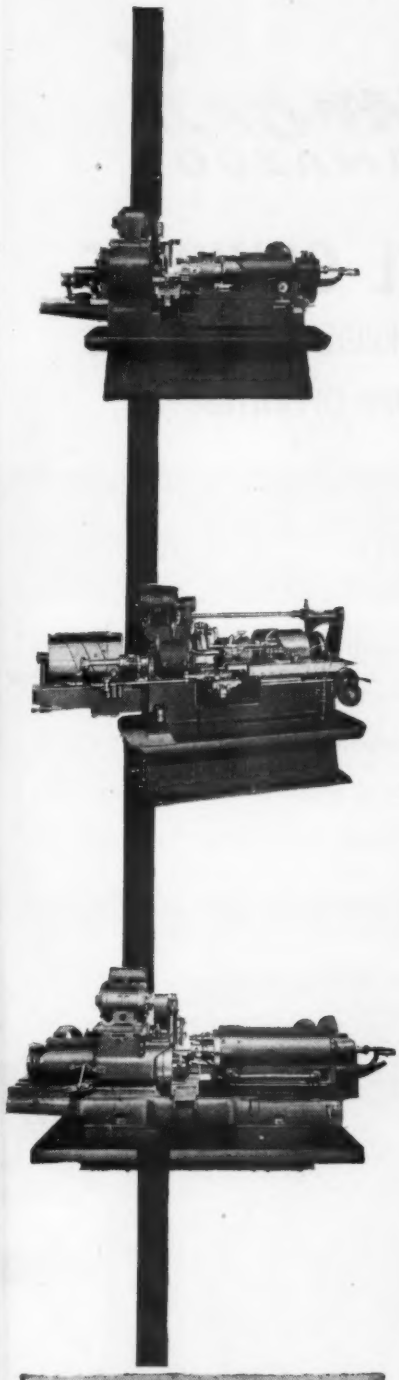
HEAVY-DUTY TABLE

Well ribbed for maximum rigidity; weighs approximately 250 lbs. Has three ⅝" ground tee slots in working surface, and permits use of large fixtures. 8" width can be ground with ¾" wheel. Ways do not uncover even on maximum length of stroke.

RIGID SADDLE

Deep box type construction assures stiffness; has large, 2 qt. capacity, oil reservoir. Bottom ways, of Vee type, are of sufficient length to prevent uncovering bed in either direction.

We will glady supply information on ABRASIVE Machines on the Government Machine Tool Surplus List . . . just send us the machine serial numbers. Attachments, accessories and repair parts can also be provided.



WHAT Constitutes A Bargain in Machine Tools . . . . . ?

Among the thousands of machine tools now declared by the government as surplus there are many which can be honestly recommended as "mighty good buys".

We believe that the most competent authority on the question of putting such equipment into condition for efficient production is the original manufacturer. For our part, we urge any purchaser of war surplus Cleveland Automatics to consult The Cleveland Automatic Machine Company regarding what it takes to make the machine a first-class production unit—that's what each Cleveland is when it leaves the factory . . . what we want reconverted Clevelands to be.

Every machine in use must be a first-class production unit if industry is to meet the problems of peace as it met those of war. So anyone buying from surplus for serious production use will be well advised to—

Select machines sufficiently up-to-date to meet competition from modern equipment geared to the increasing tempo of efficient production . . .

Base selections on realistically figured costs of production over reasonable write-off period, as compared with newer equipment.

Analyze the production history of each machine in the light of war conditions; as to hours-per-year of use, quality of maintenance, and the kind of handling it has been subjected to by its operators . . .

Determine the cost of fitting such a machine to future use. In some instances higher maintenance costs should be allowed. These, too, should be realistic figures, based upon the best authority available. If it's a Cleveland . . . ask us.

It is our desire to give full cooperation to efficient distribution of surplus machine tools, in the interests of industry as a whole.

Just Remember . . . Clevelands Cut Costs

CHICAGO (6):
1408A Civic Opera Building
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THE CLEVELAND AUTOMATIC MACHINE CO.

Hammond of KALAMAZOO

CARBIDE TOOL GRINDERS

COMPLETE LINE OF CARBIDE TOOL GRINDERS, EITHER WET or DRY OPERATION

MODEL CB-76
Chip Breaker and Diamond Finishing Grinder

HAMMOND HEAVY DUTY CHIP BREAKER AND DIAMOND FINISHING GRINDER

Heavy duty, machine tool construction and precision spindle of the CB-76 provide velvet-smooth true-running wheels and vibrationless operation — essential for accurate, fast chip breaker groove and diamond wheel finishing grinding of all single point carbide tipped tools. Write for Bulletin.

10"

10" CARBIDE GRINDER

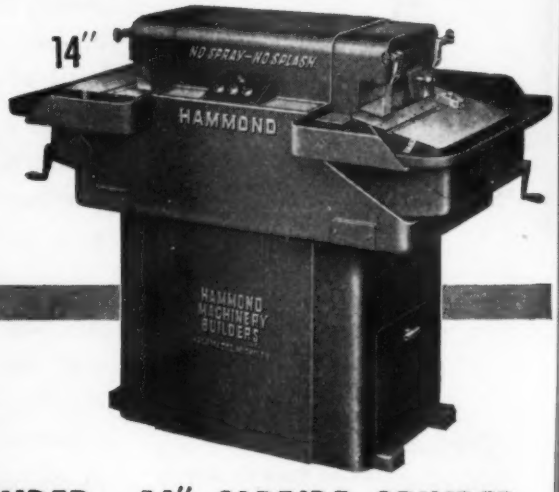
Larger spindle and bearings and heavier construction throughout, provide smooth, vibrationless grinding operations. Available in either wet or dry models. No Spray — No Splash guards and Safety Cup discs standard.

6"

6" CARBIDE GRINDER

Built for diamond wheel finishing, or for rough and finish grinding with silicon carbide wheels. Heavy construction throughout and precision spindle and bearings for true running, vibrationless grinding operations.

14"



14" CARBIDE GRINDER

An exceptionally heavily built 14" grinder for either wet or dry operation. Features No Spray — No Splash guards and Safety Cup discs. 3HP motor provides high production, large volume grinding.

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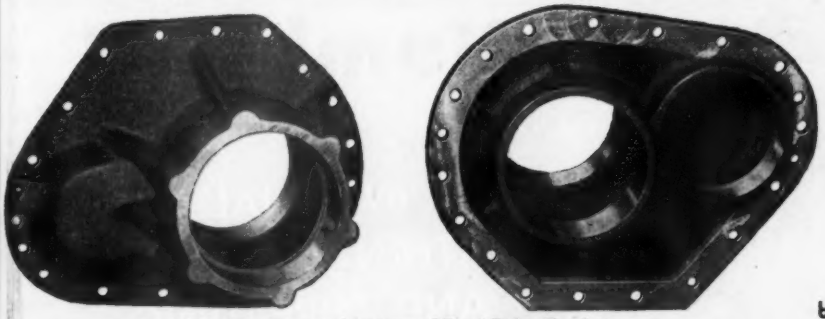
CARBIDE, GENERAL PURPOSE AND ABRASIVE BELT GRINDERS
AUTOMATIC AND CYLINDRICAL FINISHERS • POLISHING LATHES

Depth of Bore Held to .003" Consistently in Simultaneous Rough and Finish Boring

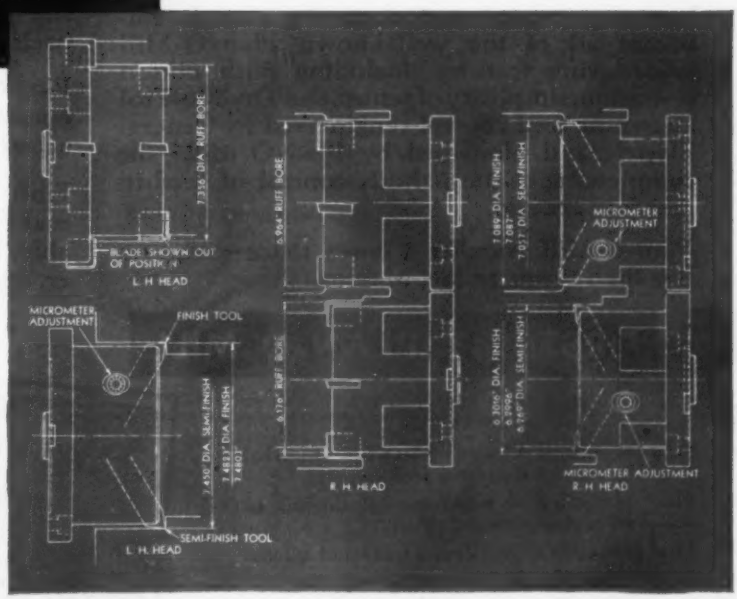


View of both top and bottom of Final Drive Bracket.

MACHINING TIME REDUCED 23.5 MINUTES

In simultaneous rough, semi-finish and finish boring of three holes in a Final Drive Bracket, (tough steel casting), the W. F. and John Barnes Horizontal Duplex Machine reduced machining time 23.5 minutes. The previous production time on other equipment was 62½ minutes. Depths of bores on all three holes are consistently held to .003". Actual cycle time of the machine is approximately three minutes and consists of rapid approach, feed, dwell, and rapid return. Both heads bore simultaneously.

The Barnes Unit-Type Machine was designed especially for the boring operations required on this part. Consisting of two standard Barnes Hydraulic Sliding Head units, it is equipped with single spindle (left hand) and two spindle (right hand) heavy duty stub boring heads. The feed and drive units are hydraulically actuated, and the machining cycle is controlled through pushbuttons. All that is required of the operator is clamping the casting into position in the special fixture designed for this job.



FIXTURE AND TOOLING ONLY ENGINEERING REQUIRED TO FIT BARNES UNIT-TYPE MACHINES TO YOUR JOBS

While specifically designed and constructed for "special" metal working jobs, Barnes machines, because of their unusual flexibility of design, are readily converted to other high production machining jobs. Heads can be changed when retooling for another workpiece, for making a combination machine, or when compensating for design changes. Work holding fixtures are simple, requiring only an adequate method of clamping and locating the part accurately.

Barnes engineers will be glad to help you in the selection of Unit-Type or Special Machines to fit into your present production lines or in laying out a new method of processing your part. Call on them without obligation or cost.

Write for your copy of "SPECIAL MACHINE TOOLS" Book (No. 1045) which contains many interesting data stories taken from the field. They may suggest a tooling or production set-up that you can use today. This book will be sent without cost to key production men.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

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Announcing PLAN-O-MILL Number 1

FOR INTERNAL AND EXTERNAL MILLING AND THREADING

- Mills and threads in one revolution . . . a complete part in as little as 8 seconds.
- Occupies less than 9 square feet of floor.

NOW YOU CAN HAVE milling accuracy with tapping speed. In Plan-O-Mill Number 1 all the recognized advantages of planetary milling and threading are provided in a compact, space-saving size designed especially for rock-bottom overhead and operating cost. It embodies all of the well-known Plan-O-Mill labor-saving features, including push button operation, simplicity of set-up, and Thy-Mo-Trol electronic feed control—engineered by General Electric and pioneered by Plan-O-Mill—for complete, split-thousandth control of feed-in and feed-around.

Plan-O-Mill Number 1 saves space—requires less than 9 square feet of floor.

Plan-O-Mill Number 1 is fast. It mills in one revolution—a complete part in as little as eight seconds!

Plan-O-Mill Number 1 is versatile. It handles any size part—even parts larger than the machine itself—because the part does not revolve.

Plan-O-Mill Number 1 requires no special skill to operate. Adjustments for wear, for size and character of work are easy to reach and easy to make.

Find out today how this new machine can make your operation more efficient and profitable. For details, contact your machinery dealer, or write direct.

5 FIRSTS BY PLAN-O-MILL

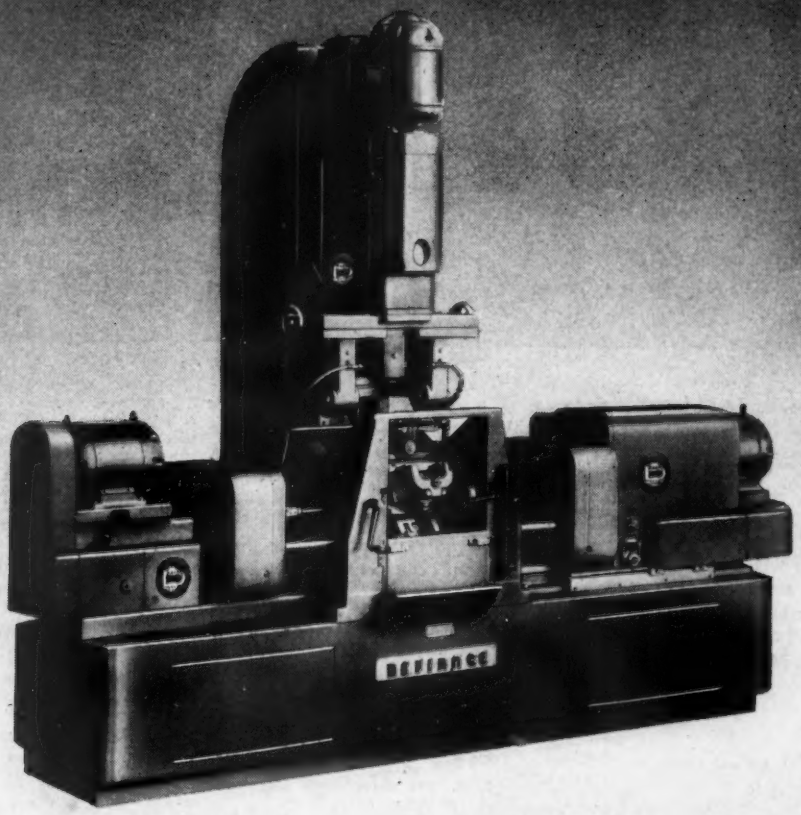
- *First to install General Electric's remarkable new Thy-mo-trol electronic feed control!*
- *First planetary to mill external threads with standard multiple thread cutter!*
- *First planetary to coordinate feeds and speeds!*
- *First to provide absolute control of feed-in!*
- *First to offer a practical, low cost carbide thread milling cutter!*

PLAN-O-MILL CORPORATION
1511 E. EIGHT MILE ROAD
HAZEL PARK, MICH.

THREAD AND FORM MILLING MACHINES — PLAN-O-MILL

THREAD AND FORM MILLING CUTTERS — PLAN-CO

HIGH PRODUCTION DRILL



● This three-way machine with five station indexing fixture shows the adaptability of Defiance Production Drilling Units to a production machine. These newly developed, greatly improved Defiance Cam and Hydraulic Units are available with standardized base and column design—for either horizontal or vertical mounting. Bases and columns are of welded steel to the dimensions required by the individual job . . . fixtures also specially designed for each job.

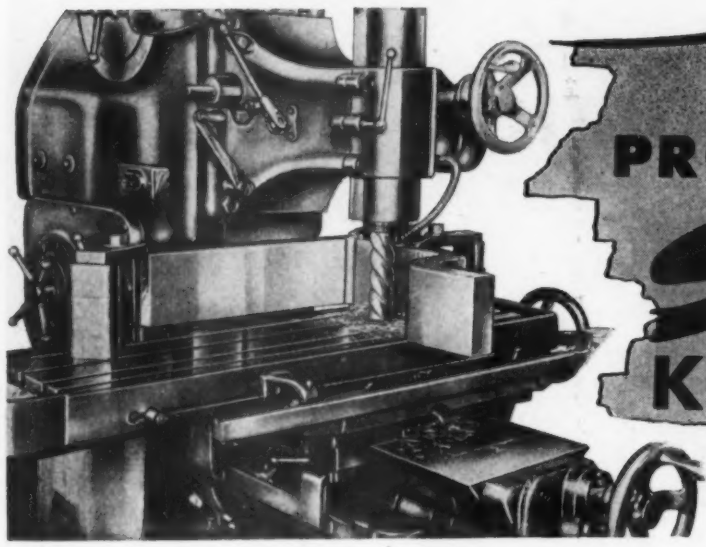
More and more shop men have learned through experience that Defiance-built Machines are "tops" in dependability, long life, and low-cost maintenance. Write for catalog.

Defiance Machine Works, Inc., Defiance, Ohio.

ARMY E NAVY

DEFIANCE

BUILDERS OF PRECISION MACHINERY SINCE



HERE'S WHY PRODUCTION MEN SELECT KNIGHT-Millers TO CUT COSTS

Multiple dry disc clutch and leather faced brake in main spindle drive gives operator positive control with flexibility to allow "inching" spindle.

Gears of alloy steel, heat treated, finish machined and shaved, mounted on short, ground shafts and ball bearings, provide sixteen spindle speeds in either direction.

Hardened, ground, and lapped spiral-bevel gears, ball bearing mounted, make sure a smooth spindle drive.

Four vertical spindle feeds for boring range from .002" to .010" per revolution.

Positive, quick acting spindle head clamp, controlled by a single lever, securely locks spindle head in any position on accurately fitted slide on face of column.

Single, constant speed motor drives main shaft through multiple V-belts. Compact and accessible. Motor and drive entirely enclosed for safety and cleanliness. Guard easily removed for servicing or adjustment.

A post, accurately ground and rigidly fitted into the column, forms the bearing on which the table unit swivels around the column.

Large trunion on which is assembled the table unit provides for tilting table in either direction. This feature and the one above add to the capacity of the machine.

The knee, actuated by large worm and gear, may be tilted 35° either side of horizontal thereby placing the table in position for angle boring or milling. Four heavy T-slot bolts solidly lock it in any position.

Table and saddle have large bearing surfaces accurately scraped and fitted with adjustable gibs providing a substantial method for locking either in any position. Table has pockets in each end for coolant drain. Both table and saddle have directional feed control levers.

Automatic safety throwout built into feed mechanism provides against overloading and will not allow re-engaging table feeds until overload is removed.

Eccentric bushing in outer table unit support bearings furnishes additional means of maintaining squareness between table and spindle.

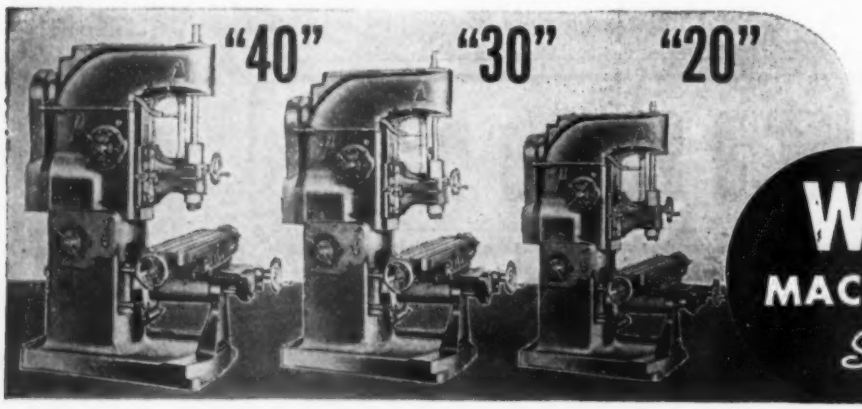
Large worm for operating gear that tilts table unit. Graduated segment on right side of unit gives position of unit in degrees.

Rotary coolant pump located in coolant reservoir in column is belt driven from the motor.

The versatile all-purpose KNIGHT Miller equips you for unusual capacity. Among the reasons for this are wide range of spindle feed, solid table unit, ease of handling. You get speed and accuracy for light milling and power and rigidity for heavy cuts.

Difficult and unusual parts are handled quickly and accurately without special equipment. You can handle difficult and unusual parts quickly and accurately without special equipment. Internal and external milling is done at one setting.

The many construction features listed contribute to versatility—speed—ability—accuracy—rigidity—accessibility and low cost—all around dependable performance. *Write for catalog.*



KNIGHT VERSATILE MILLERS ACCURATE RIGID

W. B. KNIGHT MACHINERY COMPANY

St. Louis 8, Mo.

It Can't Happen

WITH A COVEL No. 15 SURFACE GRINDER!

Work spoilage means lost time, production, and materials. When a part reaches the surface grinding point, it invariably is 90% finished. Complete loss results should the grinding wheel DROP INTO the work. Such an accident *absolutely* cannot happen on a COVEL No. 15 because:

THE SPINDLE REMAINS STATIONARY WHILE THE WORK *MOVES UP* TO THE WHEEL

This simple but vital design feature is only one of many reasons why plant men prefer the COVEL No. 15.

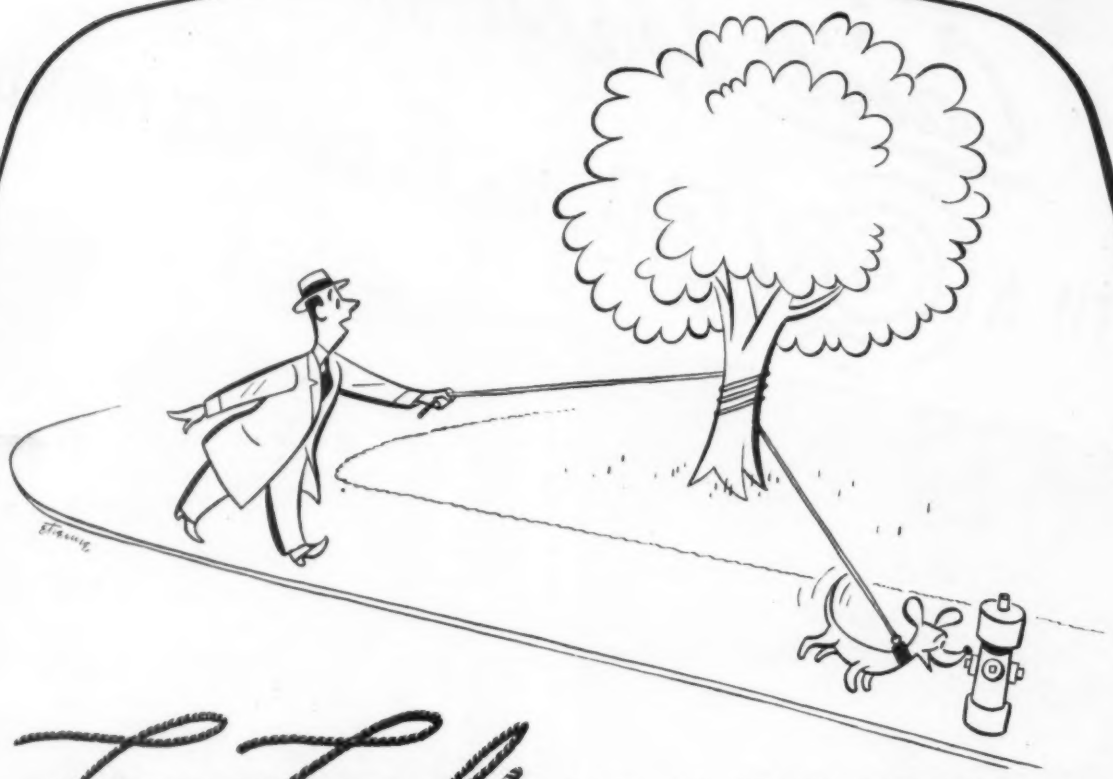
Set-up on the Covel No. 15 (6" x 18") Hand Feed Surface Grinder. Spindle is stationary; table has full 11" vertical travel. Three spindle speeds make it ideal for short production runs where quick set-ups, accurate grinding of odd shaped pieces, mean reduced production costs.

See Your Nearest Covel Dealer or Write for Bulletin A-225.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

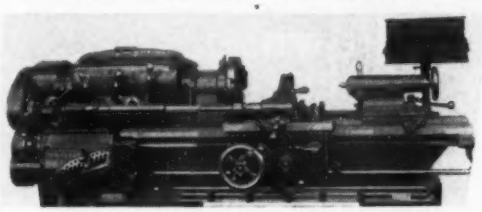
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.



Long Leads CAN BE TROUBLESOME

A common problem in most tool rooms is the production of threads and cutters with long leads. Hendey solved this problem with a unique, yet simple device—the Hendey Sub-Headstock. This attachment is placed on the ways just ahead of, and is driven by, the main headstock. The driving plate revolves one turn to six turns of the spindle. The sub-headstock is used for chasing screw threads with long leads beyond the range given on the index plate, and may be used for cutting multiple-start threads. When used with the Hendey Relieving Attachment, it will relieve wide forming tools and hobs with long leads, and cutters with a large number of teeth.

Attachments such as these will increase the usefulness of your Hendey tool room lathes; therefore, it will pay to write for full details.



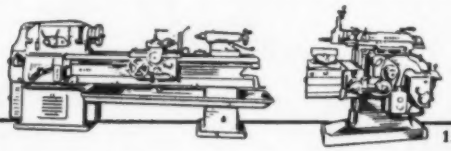
Hendey Sub-Headstock and Relieving Attachment

The Hendey Machine Company

Hendey

Main Office and Plant **— Torrington, Connecticut**

Branch Offices **— New York, Chicago, Boston, Detroit, and Rochester**
Representatives in **— Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco**



TOOL ROOM LATHES
12"-16"-18"

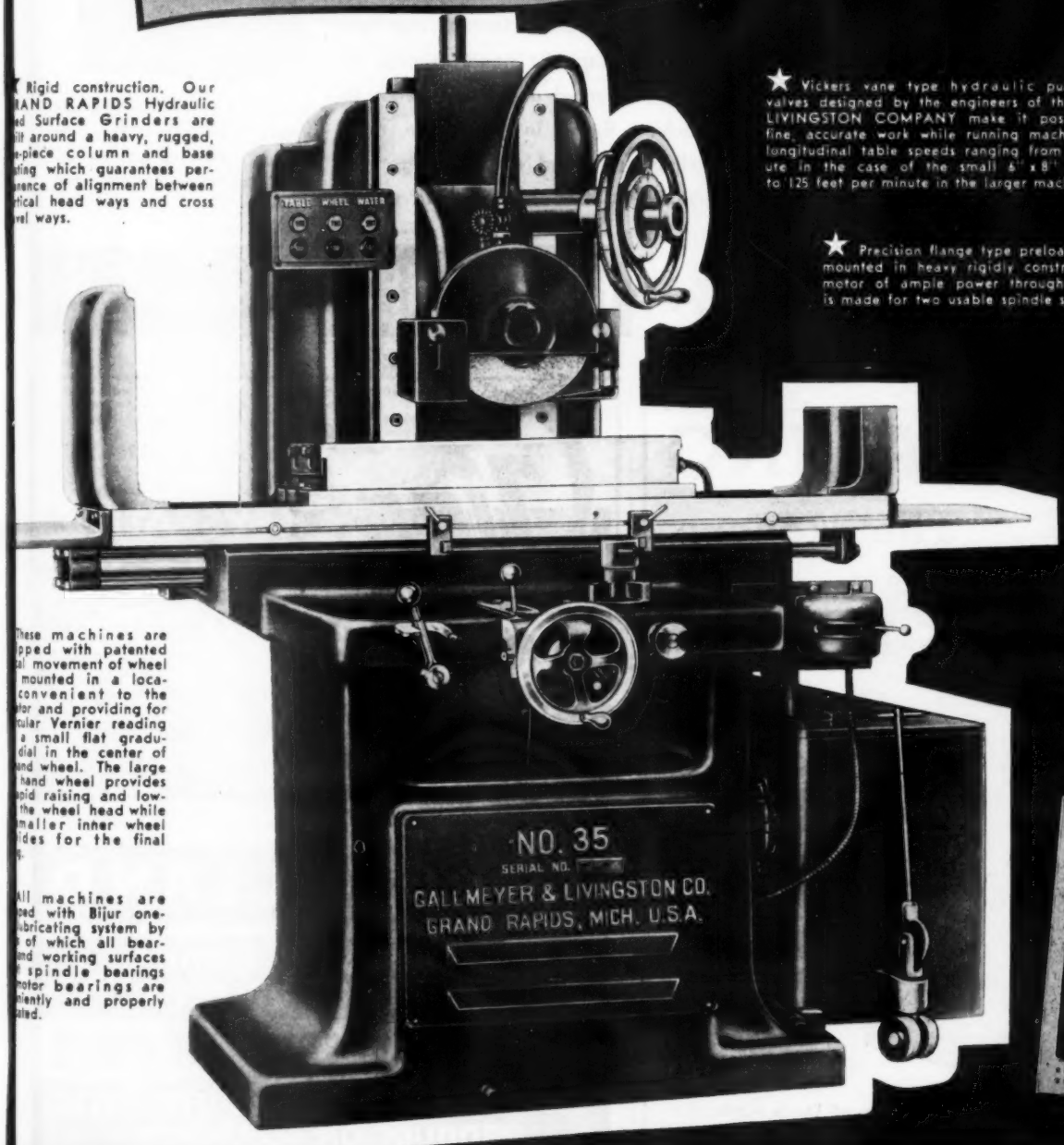
SHAPERS
12"-16"-20"-24"-28"

Joe:

HERE IS WHY PRECISION SURFACE GRINDING IS NO LONGER THE BOTTLE NECK IN YOUR TOOL ROOM

Bill

★ Rigid construction. Our RAND RAPIDS Hydraulic ed Surface Grinders are lit around a heavy, rugged, e-piece column and base ding which guarantees per- nence of alignment between tical head ways and cross val ways.



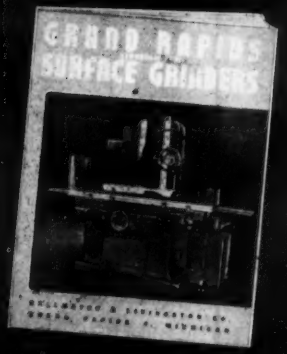
★ Vickers vane type hydraulic pumps and control valves designed by the engineers of the GALLMEYER & LIVINGSTON COMPANY make it possible to produce fine, accurate work while running machines at maximum longitudinal table speeds ranging from 80 feet per minute in the case of the small 5" x 8" capacity grinder to 125 feet per minute in the larger machines.

★ Precision flange type preloaded ball bearing spindle mounted in heavy rigidly constructed head is driven by motor of ample power through vee-belts and provision is made for two usable spindle speeds.

These machines are pped with patented al movement of wheel mounted in a loca- convenient to the tor and providing for cular Vernier reading a small flat gradu- dial in the center of and wheel. The large hand wheel provides pid raising and low- the wheel head while maller inner wheel ides for the final g.

All machines are ped with Bijur one- ubricating system by of which all bear- nd working surfaces spindle bearings otor bearings are iently and properly ated.

★ If you are interested in modern high-speed Hydraulic Feed Surface Grinders in which tool room accuracy is combined with production speeds, we suggest that you ask for bulletin GL-101.

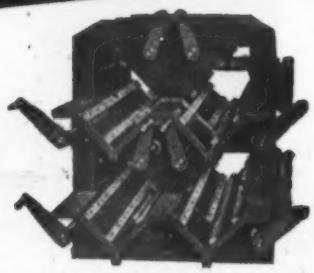


GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE. S.W.

GRAND RAPIDS. 4 MICHIGAN

HOEFER Two-Deck Fixture Speeds Machining ..Drilling and Tapping.... of 3 different sized cylinder heads for Diesel Motor



DRILLING 7/16—55' per minute, 475 r.p.m. .006 feed, one minute.
7/16—56' per minute, 390 r.p.m. .007 feed, one minute.
TAPPING 21' a minute, 213 r.p.m. forward and reverse, complete cycle 30 seconds.
TAPPING 22' per minute, 173 r.p.m. complete cycle 30 seconds.

★ The view at left is of tunnel fixture designed to handle the drilling and tapping of three different sized cylinder heads on Diesel Engines, for bolting on flanges of manifolds. The upper deck, right and left, takes care of drilling and tapping one size cylinder head while lower deck takes care of two additional sizes with identical manifold hole layouts. Two 16-spindle heads, similar to one at right, were mounted on opposite ends to a two-way machine, fixture in the middle, right hand end drilling, left hand end tapping, with tapping reverse in machine—positive lead screw.

When you have more than one hole to drill, let HOEFER help you drill them to get the utmost in time savings and economy.

Hoefer's Whole Business is Holes.... **HOEFER MFG. CO.** *Freeport, Ill.*

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

For cutting internal keyways, slots or splines 1/10" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS
MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Avey Sensitive DRILLING MACHINES
CINCINNATI OHIO

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

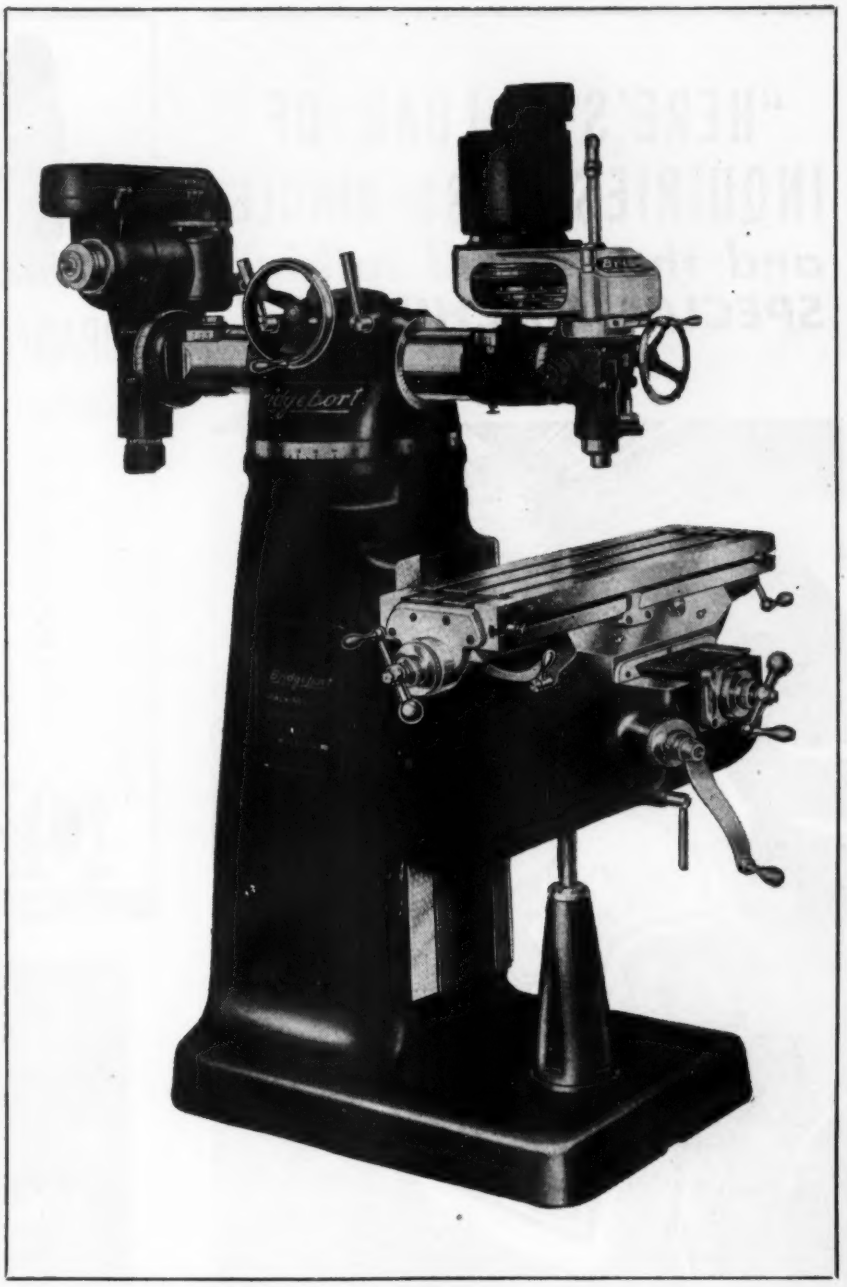
½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Bridgeport

TURRET MILLING MACHINE



Specifications

Longitudinal Feed—20″
Cross Feed—9″
Vertical Feed of Knee—16″
Standard Table—9″ x 32″
Special Tables up to 48″ available; also longitudinal power feed
Weight with Shaping Unit—2000 lbs.

Bridgeport Turret Milling Machines have everything looked for in a modern machine tool . . . speed, power, precision and convenience. And they will be modern and economical for many years to come, meeting every requirement for low cost and high quality in post war production. The outstanding features of the "Bridgeport" are its ability to mill, drill, bore and shape at all angles of the work without change of set up and for maintaining tool room accuracy in production.

Write for complete information.

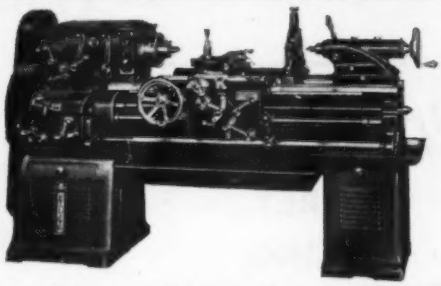
The Bridgeport MACHINES, Inc.
Bridgeport, Conn.

"HERE'S A LOAD OF INQUIRIES, MISS DINGLE, *and they're all talking SPECIAL MACHINERY!*"

FENN SPECIAL MACHINERY

Reconversion to peace-time production depends on having the machines and tools needed to meet a deluge of V-Day orders. In the race for new markets and customers the manufacturer with up-to-the-minute equipment wins. Fenn-Built Special Machinery is a time, labor and money saver. Two big, modern plants are ready to build Special Machinery and Tools for peace-time needs with war-time speed.

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

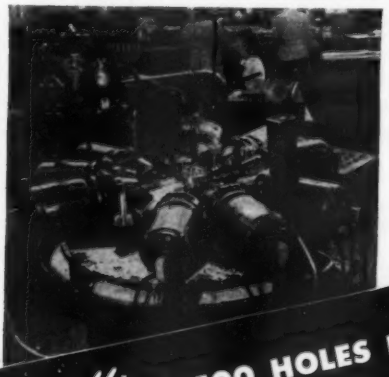


BRADFORD *Metalmaster* LATHE

features . . .

1. Oil Gages.
2. Push Button Station.
3. Three Speed-Change Levers.
4. Large Dials.
5. Offset Compound Rest.
6. Heavy Tailstock Clamp Bolts.
7. Ball Thrust Bearing.
8. Adjustable Feed Stop—Either Direction.
9. Starter in Leg.
10. Leveling Screws.
11. Sixty-four Feeds and Threads.

The BRADFORD MACHINE TOOL CO.
1840—1945 CINCINNATI, OHIO



Drilling **4500 HOLES PER HOUR!**

. . . 9 Holes at Once!

The tremendous production made possible by Govro-Nelson Automatic Drilling Units is well illustrated by the above set-up at the Michigan Die Casting Co., Detroit, for the multiple drilling of 18 holes (7/32") in a fuse part of die-cast aluminum and SAE 3135 steel. Drills 9 holes at once, automatically indexes and drills second 9 holes. Output: 250 pieces per hour.

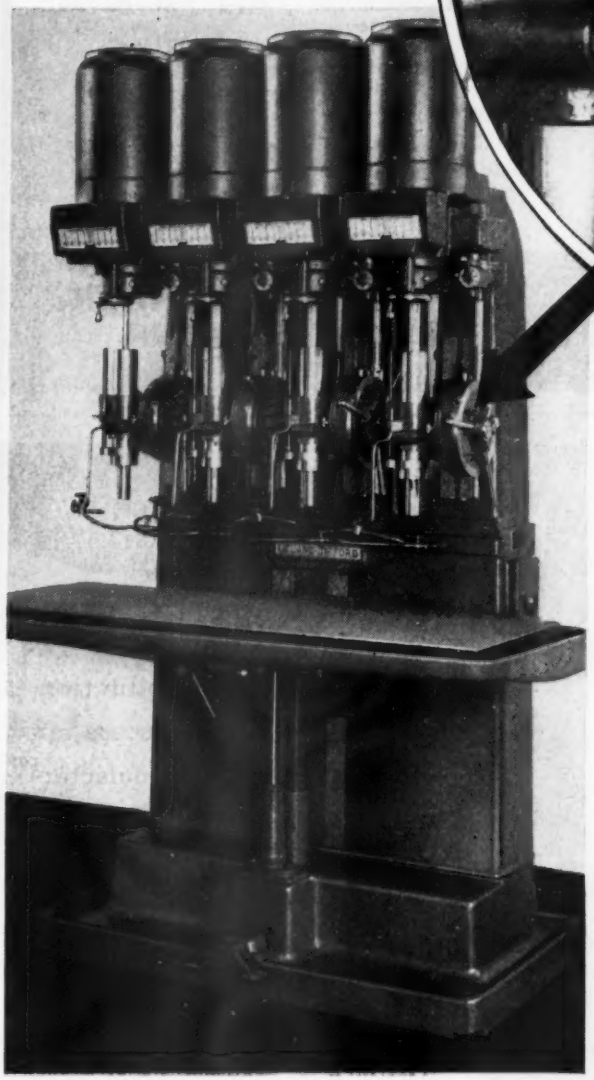
WRITE FOR *Literature*

Designed for drilling up to 3/8", depending upon the material. Other models available for different speeds and conditions. Send for literature showing typical applications.

GOVRO-NELSON CO.
1933 Antoinette
DETROIT 8, MICH.

Automatic **DRILLING UNIT**

LELAND GIFFORD POWER FEED



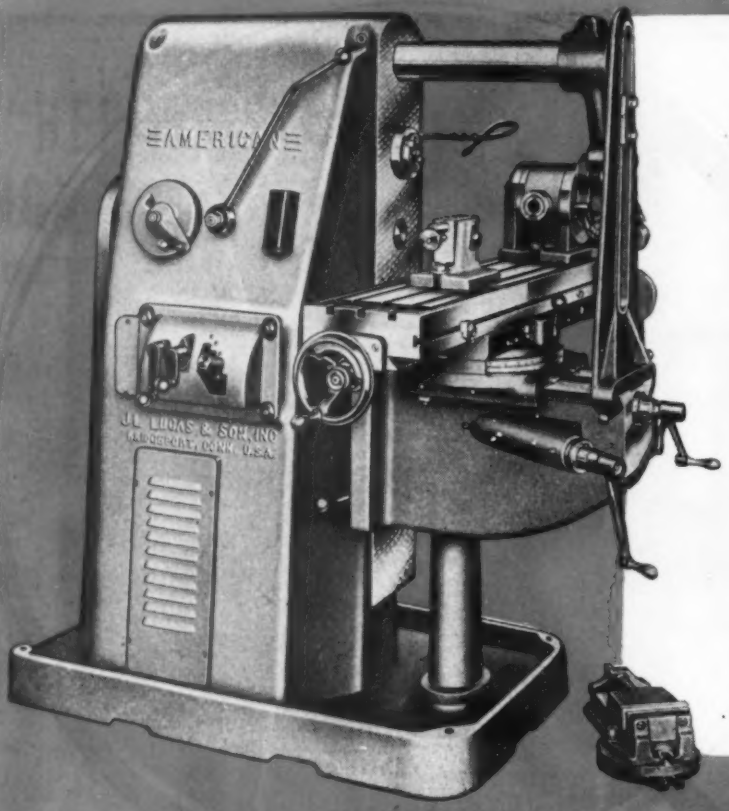
This POWER FEED

is engaged by the natural movement of starting the drill into the work with the feed lever, and may be disengaged by the reverse movement. A positive adjustable depth stop is provided. A ring graduated in 64ths of an inch makes setting easy.

For Reaming when a Positive Engagement is necessary before the tool strikes the work, the power feed may be furnished with Hand Engagement which starts the feed with a squeeze of the hand. When the machine is to be used intermittently for hand feed operation a **Locking Pin** is included to make the power feed inoperative.

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.



EXPLORE THE POSSIBILITIES of the No. 2 AMERICAN PLAIN and UNIVERSAL MILLING MACHINE ON YOUR WORK

Offering infinite spindle speeds—Motor in base drive—Standardized spindle nose—heavy rugged construction—versatility for a wide range of work.

The following specifications apply to both Plain and Universal Types

TABLE—Working Surface—46"x10½"
T-slots—3-11/16"

RANGE—Longitudinal Power Feed—25"
Transverse Power Feed—9"
Vertical Hand Feed—17"
Max. Distance spindle to table—17"

SPINDLE—Standardized Flanged Nose—No. 40 Taper
Hole through spindle—21/32" dia.
Length Front Bearing—5"
Speeds—Infinite—Range 25-500 RPM

FEEDS—16

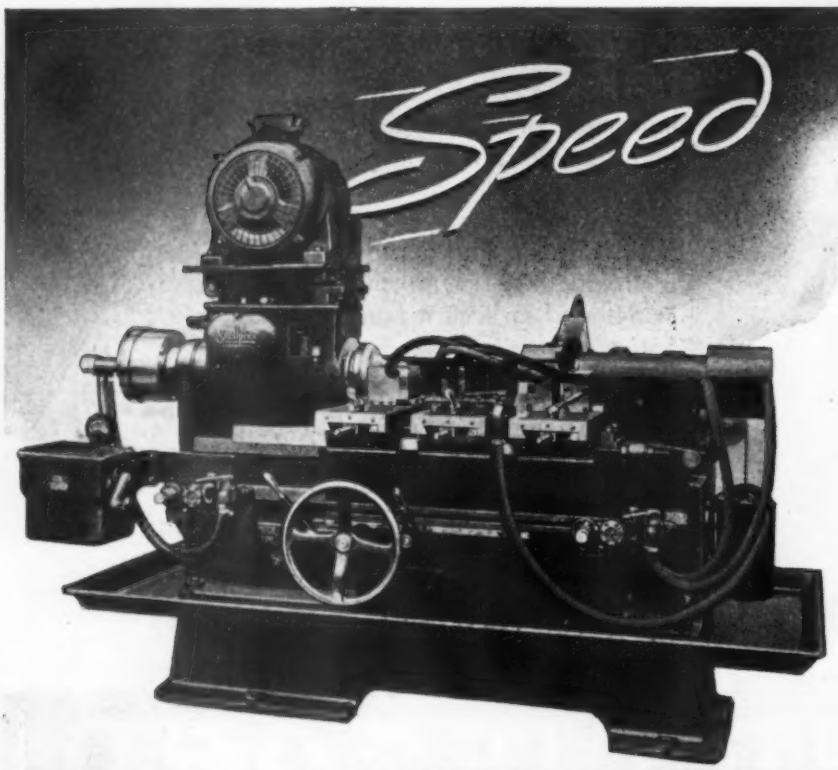
OVERARM—Dist. to center of Arbor—6½"

FLOOR SPACE—85"x68"

Prompt Deliveries Now Available

J. L. LUCAS & SON, Inc.
BRIDGEPORT, CONN.

Send for Illustrated literature—



SPELLS SUCCESS

The Smallpeice Production Lathe spells equal success for either peace or war manufacturing. It is the ideal production machine for every type of regular turning, boring, facing and profiling—with a versatility that means a fine investment.

For complete information write Smallpeice, Ltd., 505 Rantoul Street, Beverly, Massachusetts.

SMALLPEICE

MACHINE TOOLS AND EQUIPMENT · MANUFACTURED IN U.S.A. AND GREAT BRITAIN

RIGIDITY

for high-speed turning of high-Brinell steels

Today's limits of accuracy for large-capacity, heavy-duty lathes would have been considered "tight" even for toolroom lathes before the war. Today's foot-per-minute speeds on tough, high-Brinell steels would have been considered fast for semi-steels.

That's why it will repay you to re-tool with Lipe Carbo-Matics even if your pre-war lathes are far from worn out. Lipe's rock-like rigidity, coupled with Lipe's smooth-flowing power give rough-grinding accuracy at the carbide-tool speeds that postwar competition will require.

Notice how the massive bed and headstock are cast in one piece, providing extra strength and resistance to torsional stress.

Notice how the heavy sidewalls of the bed are reinforced by cross ribs spaced for maximum strength, insuring high resistance to torsional stresses and strains.

Notice the massive bulk of the tailstock, adequate to hold high-speed centers without deflection or vibration.

Ask your nearest distributor for detailed information, or write for specifications and performance data to

Lipe-Rollway
CORPORATION
Syracuse, N. Y.

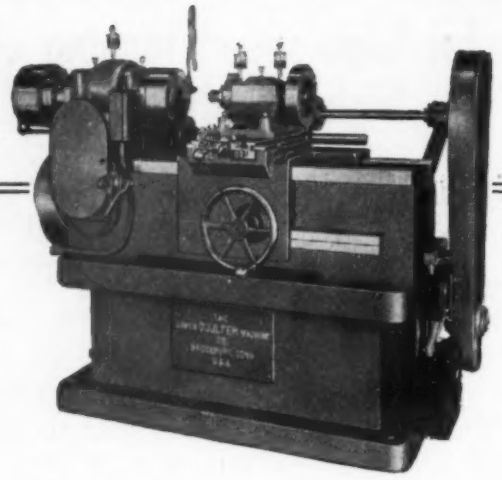
Special Industrial Machinery Since 1875

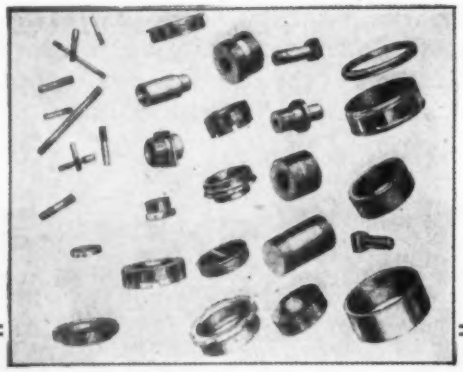
LIPE

Carbo-Matic Lathe

fully-hydraulic operation with 264 changes of spindle speed; low-gear 62 to 1046 r.p.m.; high-gear 600 to 3600 r.p.m.; swing over carriage 8", between centers 30"

Any parts that can be chucked can be threaded on the COULTER HOB THREAD MILLER





. . . a universal machine for automatic production of internal or external right or left hand threads

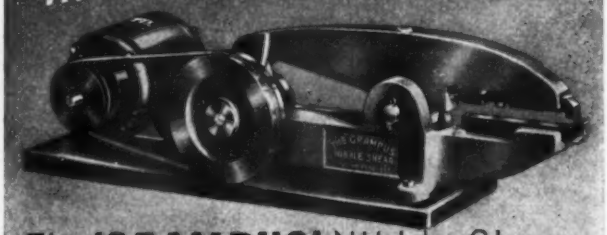
Hob Threaded work can be handled with speed and precision on this rigid, simple fully motorized machine. The variety of work it is capable of handling is almost unlimited because any parts that may be held by chuck or special fixture can be threaded. The design of this machine is such that long work can also be accommodated.

Work and cutter spindles are each driven by individual motor, a wide range of speeds and feeds being available for threading of parts of various materials. Once the machine has been started on the first piece, the entire operation is automatic until time for unloading.

Explore the possibilities of the "Coulter" on your external and internal threading by writing for further information.

THE JAMES COULTER MACHINE CO.
BRIDGEPORT, CONNECTICUT

THE MACHINE THAT SOLVED MANY OF BRITAIN'S SHEET METAL PROBLEMS IN THE EUROPEAN WAR!



The **'GRAMPUS'** Nibble Shear

U.S.A. Patent No. 2333293. Patented also in Canada. Other Patents pending.

Trims difficult Pressings, Channel Sections, Panels, Tubes, etc., in all metals, and in many materials, including: Hide, Fibre and Paper. Seams, Tucks, Beads, Grooves with Form Tools in place of Cutters.

★ ★ ★ **We are open to offers from manufacturers for outright purchase of U.S.A. Patent rights, alternatively for rights to manufacture under licence, or for an arrangement to produce in collaboration with Patentee.**

LAKESIDE ENGINEERING WORKS
(Proprietors: California in England Ltd.)
WOKINGHAM, BERKS, ENGLAND

Whoever thinks of hardness testing equipment thinks of the

"ROCKWELL" HARDNESS TESTER

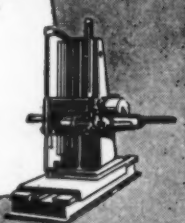
Now and always made only by

WILSON
MECHANICAL INSTRUMENT CO. INC.
357 Concord Ave., New York 54

An Associate Company of American Chain & Cable

GILBERT

PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



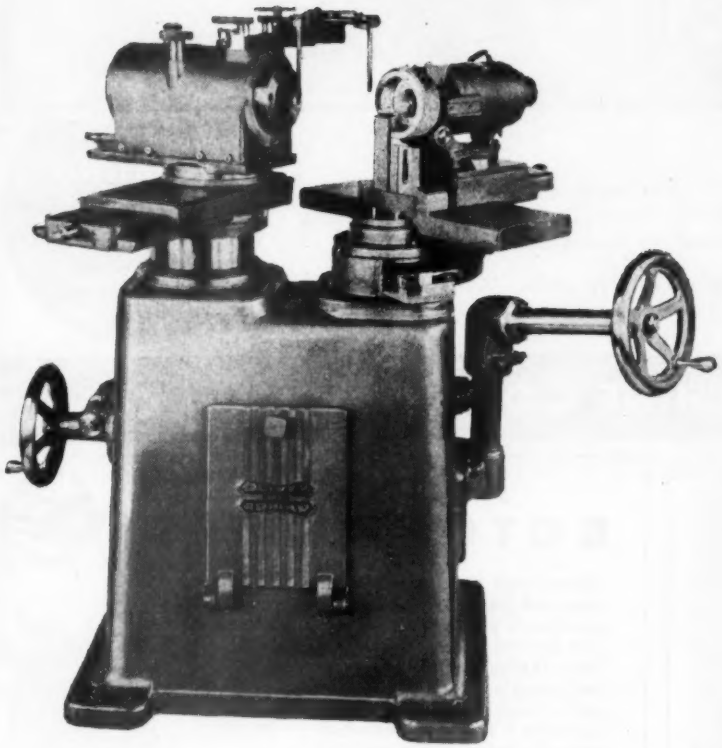
DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

FOR *More Efficient*

FACE MILL GRINDING!

Read the facts →



Here are the important features of the OLIVER NO. 2 "ARC" FACE MILL GRINDER

WILL SHARPEN

A. Any radius from 0" to 2"
B. Any angle from 0 to 90 degrees
C. Any angle of dish, plus or minus

(The clearance on the periphery may be greater than on the face.)

SHARPENS cutters from 6" to 26" diameter. (No. 2A Machine, not illustrated, available for smaller work, 1" to 6" diameter.)

GRINDS correct face and periphery on all types of face mills, creating a round corner between these two surfaces, thus decreasing danger of cutter breakage caused by sharp corners. Performs these operations in one continuous movement, making it necessary to index the cutter only 1/3 the number of times.

STRAIGHT GRINDING IF DESIRED. If straight grind is desired, radius lock may be disengaged, permitting straight travel of 6" at any angle to the spindle axis. Increased travel (to approx. 10") obtained by removing carriage and plates.

LARGE HEAVY ROLLER BEARING SPINDLE. To provide rigidity and absolute accuracy, the spindle for holding the cutter is extremely large and heavy, and is mounted on precision roller bearings.

PRECISION GRINDING UNIT. Ball bearing motor grinding unit, built in our own factory, operates at 3450 RPM, provides a full ¾ HP. Equipped with precision ball bearings, thoroughly protected from emery. Motor provided with automatic take-up to eliminate and play.

CONVENIENT WHEEL TRUEING DEVICE, positioned to be instantly available for dressing the wheel, is another "ARC" feature which assures uniformity of grind.

Don't Neglect Your Toolroom It's the Backbone of Production!

- **Less grinding time!**
- **Improved work!**
- **Longer cutter life!**

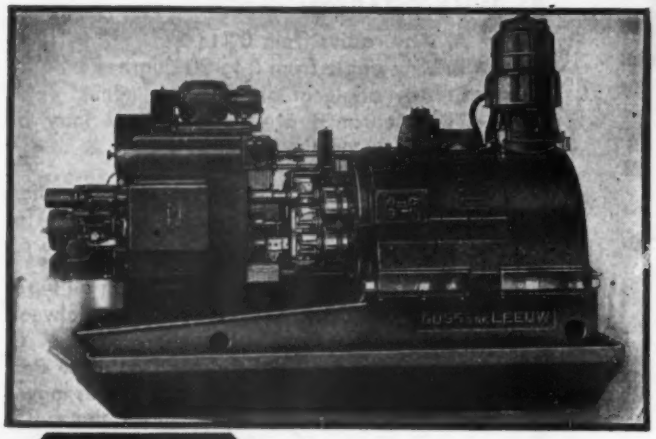
OLIVER NO. 2 ARC FACE MILL GRINDER

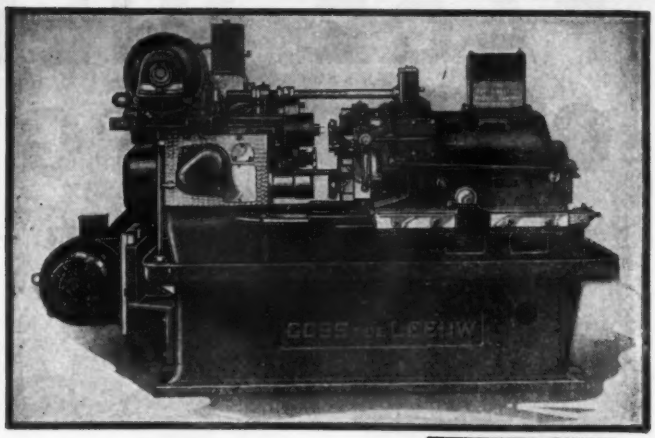
Write: **OLIVER INSTRUMENT COMPANY**
1414 E. Maumee St. Adrian, Michigan

Oliver
OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

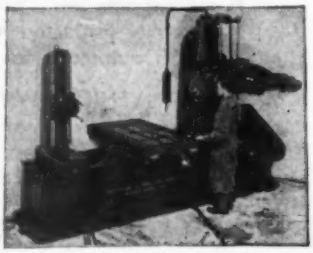
Write for copy of descriptive catalog giving complete, detailed specifications.

WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

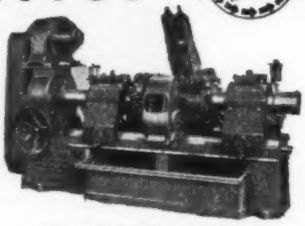


Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

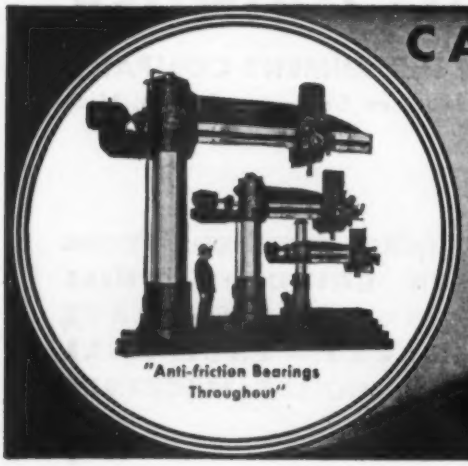
Horizontal ROTO-MATICS

When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. *Bulletins 110 and 120* are available for suggested solutions to your problems.



No. 1-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin



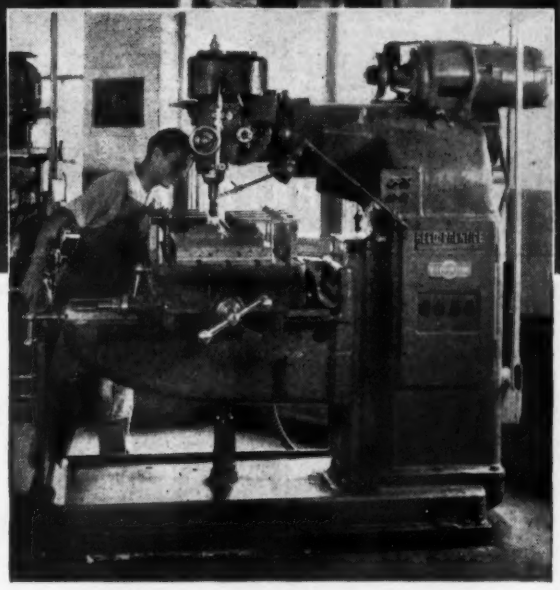
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

VERSATILITY



REED-PRENTICE No. 22-V

UNIVERSAL HEAD VERTICAL MILLER and DIE SINKER

The 22-V Miller shown above illustrates the machining of a 16 cavity curved comb mold at the plant of Guy P. Harvey & Son, Leominster, Mass., largest exclusive injection mold makers in the world.

The exceptional range of this machine permits the milling of 32 pieces at a single set-up (as shown), affording greater uniformity and a substantial saving of production time.

Die makers in this company insist on using this machine because the wide range, large table and infinitely variable feeds and spindle speeds, make it possible to do all milling, drilling and boring operations with one set-up.

★ FEATURES ★

1. Universal head — mounted on sliding ram.
2. Extreme rigidity of head and ram.
3. Extraordinary range.
4. With electronically controlled infinite feeds.
5. Infinitely variable spindle speeds.

★ SPECIFICATIONS ★

Longitudinal feed (hand or "electronic" power)	27"
Cross feed (hand or "electronic" power)	20"
Vertical feed of knee (hand)	16"
Horizontal ram adjustment (hand)	16"
Table: length by width by thickness	32 x 22 x 4"
Spindle speeds (infinitely variable)	90 — 2200 RPM
Vertical travel of spindle	5"
Taper hole in spindle NMTBA	#40
Throat depth, with ram fully extended	30"
Electronic power cross or longitudinal feeds	½"—40" per min.
Weight — with power feed	6,750 lbs.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

NEW YORK OFFICE: 75 West St., NewYork 6, N. Y.
CLEVELAND OFFICE: 1213 W. 3rd. St., Cleveland 13, Ohio

MACHINE
REED-PRENTICE CORP.
WORCESTER TOOLS MASS., U.S.A.

SPEED IN COLD METAL SAWING

The PORTER - McLEOD IS DESIGNED FOR HIGH SPEED COLD METAL SAWING

Straight, clean cuts on a truly high production basis are assured by the 8" Porter-McLeod. It is a compact, sturdy, amply powered unit designed for handling general or production work with utmost operating convenience and control. Economical quantities of bars or shapes can be "nested" and held rigidly during cutting by means of supports provided on sides and bottom combined with clamping pressure at top.

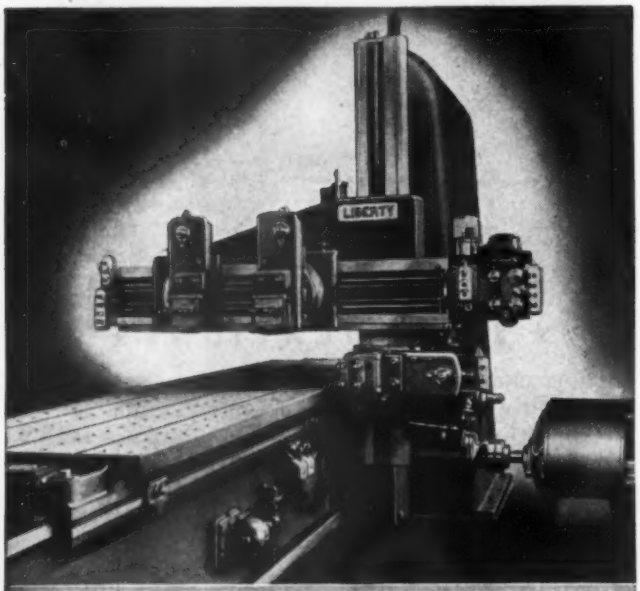
In the Porter-McLeod, the blade is supported for accurate cutting and for protection against damage. Adjustment is also provided for changes in blade thickness. Feed of blade is upward to stock with provision made to prevent weaving and buckling. Standard feeds up to 3" per minute are available. Protection against blade breakage due to hard spots in stock is provided by a friction feed disc.

This machine will handle either 8" round or 7½" square stock or the equivalent in "nested" work.

Investigate the high production possibilities of this machine by sending for descriptive Bulletin.

MACHINE TOOL COMPANY

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASSACHUSETTS, U.S.A.



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SMALL, MEDIUM AND HEAVY DUTY
PLANERS
FOR HIGH SPEED, LOW COST PRODUCTION

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Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

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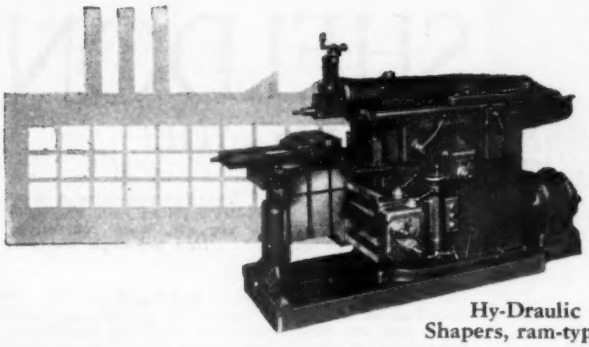
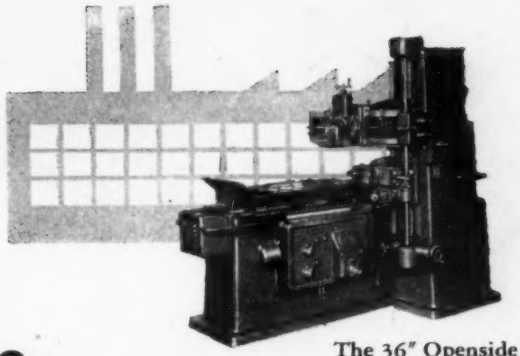


Hy-Draulic
Shapers, ram-type.



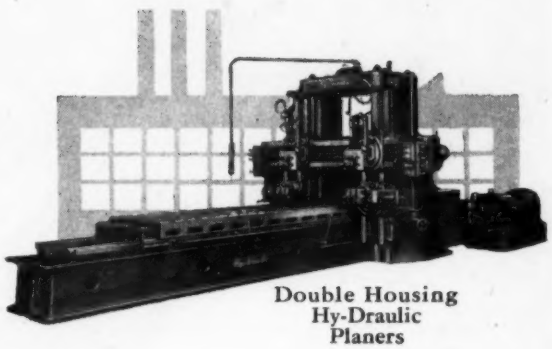
The 36" Openside
Hy-Draulic Shaper

An Invitation to the 14 and 20

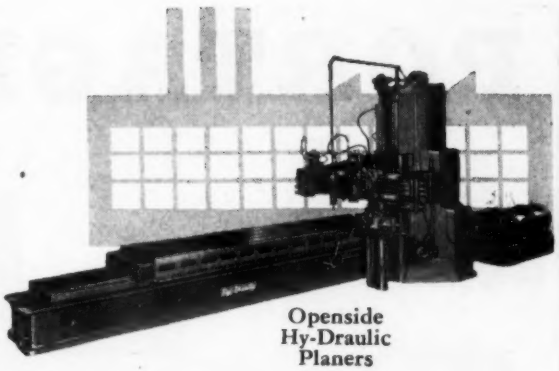
Of the plants studied in a recent survey, 14% report intentions to buy new planers and 20% new shapers.

Executives of these plants, and all others having similar intentions, are invited to investigate Rockford Hy-Draulic Planers and Shapers before making their decisions.

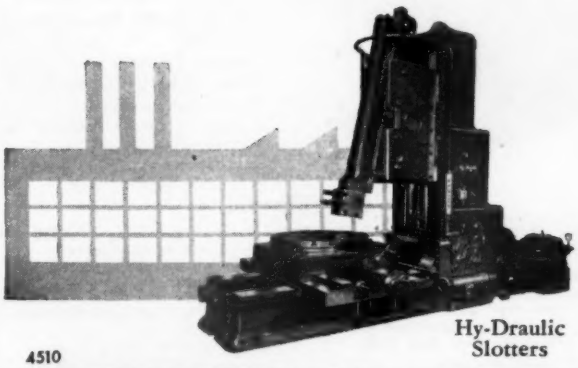
High grade in every respect, Rockford Hy-Draulic machine tools have the outstanding advantages of hydraulic drive and hydraulic feeds. They give you extra speed of set-up, ease of operation and rapid production of high quality work at low cost . . . plus values that have special importance right now. Write for details. Please mark your inquiry for the attention of Dept. 1128.



Double Housing
Hy-Draulic
Planers

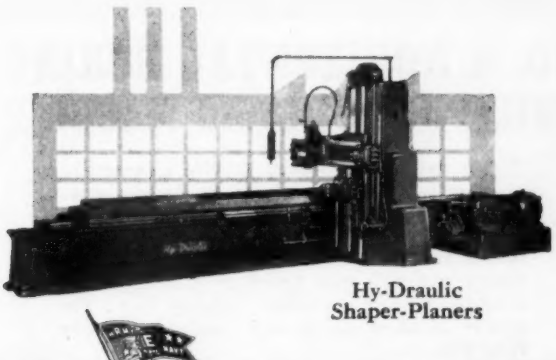


Openside
Hy-Draulic
Planers



Hy-Draulic
Slotters

4510

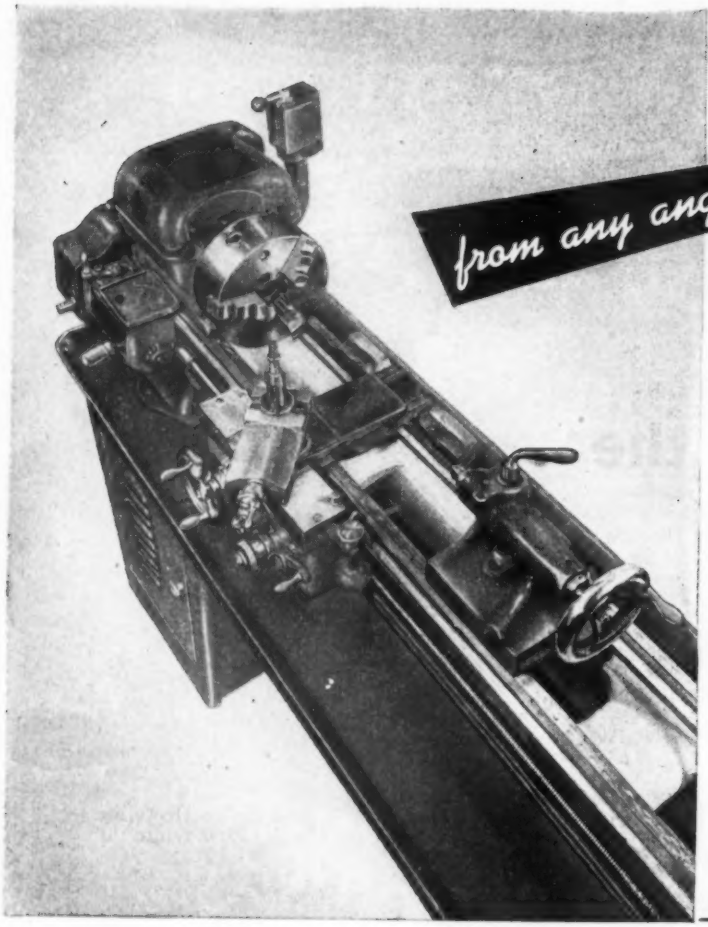


Hy-Draulic
Shaper-Planers

Hy-Draulic

ROCKFORD MACHINE TOOL CO.

ROCKFORD, ILLINOIS



SHELDON

S-56 LATHE

. . . compare a SHELDON S-56 Precision lathe with all other 10" lathes in the moderate priced field, and you'll find more accuracy, more capacity, more convenience, more design, more quality . . . *from any angle just more lathe.*

The SHELDON S-56 lathe has a bed length of 56", with rigid T-girted bed with 2 V-ways and 2 Flat ways which are ground and hand scraped to .0005" of both lateral and parallel alignment. Lead screws are cut on the finest Pratt & Whitney "super precision" lead screw machine. The S-56 lathe with 56" bed is mounted on a rigid 5 drawer steel bench (S-44 with 44" bed on a 4 drawer steel bench) which houses an efficient 4-speed (8 spindle speed) underneath motor drive. Each come with full quick change gears, power longitudinal and cross feeds and standard big lathe features.

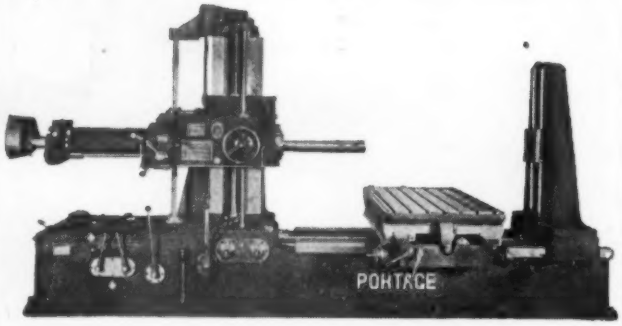
- Heavy bronze bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

SHELDON MACHINE CO., INC.

4234 N. Knox Ave. Chicago 41, U. S. A.

Builders of Good Lathes Since 1919

PORTAGE



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• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

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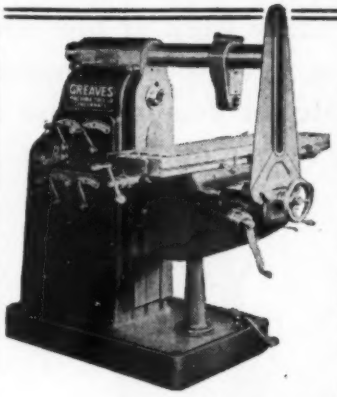
GREAVES No. 2

PLAIN or UNIVERSAL MILLING MACHINE

. . . for Speed, Accuracy, Production and Tool Room Work . . .



featuring:

Power Feeds, all Directions
Rapid Traverse—6-way
Alloy Hardened Gears
One Shot Lubrication to Table, Saddle Slides and Screws
All Speed and Feed Changes through Positive Gearing
All Speed and Feed Gearing run in Oil
Timken Bearings
Glass Sight Oil Control
Unit Construction
Central Control Position for all Operation Levers
Coolant System

Specifications

Table—52¼"x12"
Feed range—Longitudinal Power Feed 28"
Cross Power Feed 10"
Vertical Power Feed 19"
Overarm—4½" diameter
Spindle—Chrome nickel steel National Standard taper hole #50
Speeds—18—Range 20-1000 RPM Reverse on all speeds
Feeds—9—Range ½" to 18" per minute
Rapid traverse—Longitudinal—cross and vertical—All directions—75" per minute
Weight—3750 lbs.

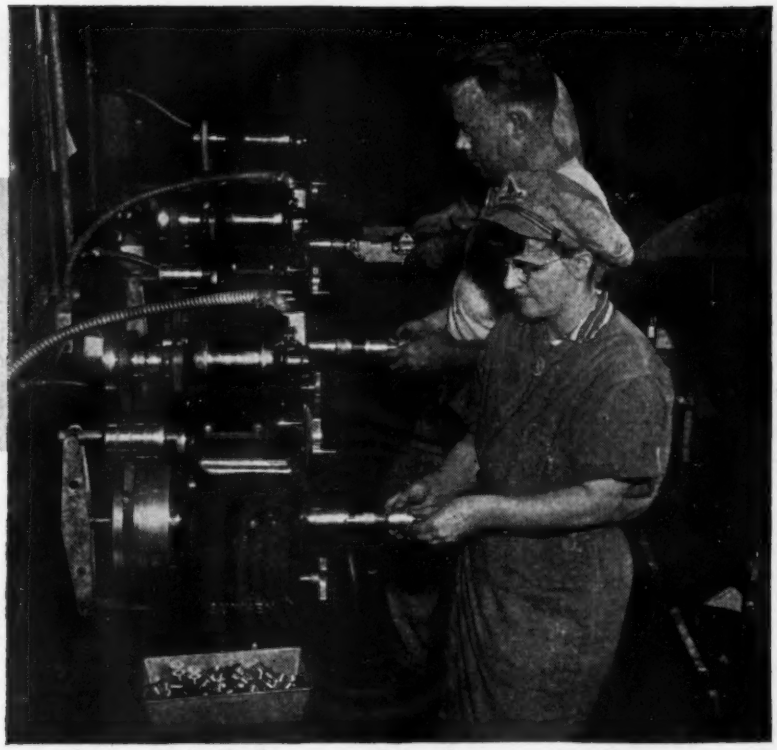
Send for illustrated literature giving complete information.
Write for nearest agent or dealer

Exclusive Distributors

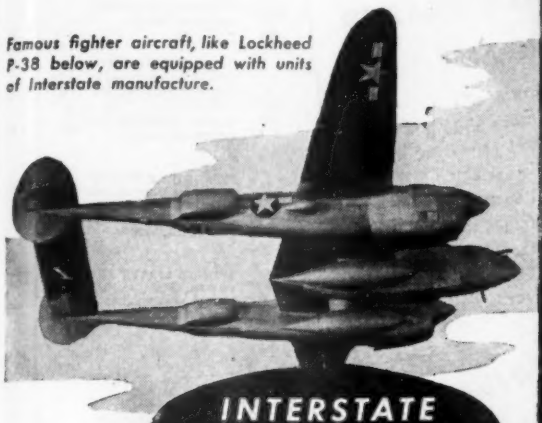
H. LEACH MACHINERY CO.

387 CHARLES STREET PROVIDENCE, R. I.

Battery of SUNNEN honing machines which have been employed since inception of critical defense program in production of precision parts for war aircraft.



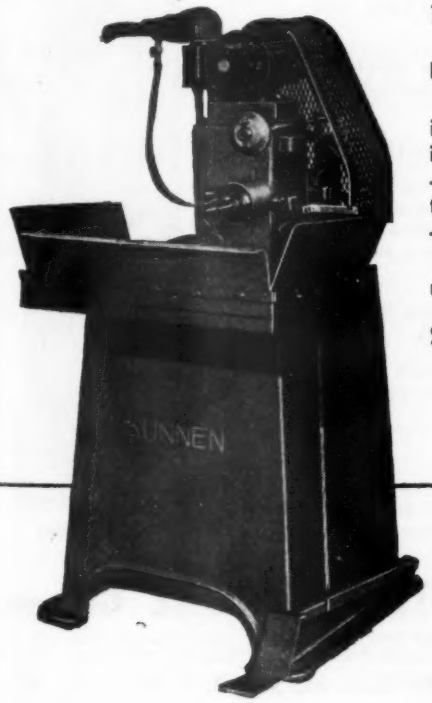
Famous fighter aircraft, like Lockheed P-38 below, are equipped with units of Interstate manufacture.



INTERSTATE is many things to many Planes

Why Accuracy Is Demanded at Interstate

Many leading war aircraft depend in action on vital, precision parts produced by Interstate Aircraft and Engineering Corporation. For instance—machine guns are charged for firing, bombs released, wing flaps operated, motor temperatures controlled, landing gears retracted—by Interstate built units which must be unfailing under severest test and require in their manufacture the closest tolerances. Hydraulic, pneumatic control devices, a wide variety of valves, cylinders and custom built mechanisms, are important features of Interstate manufacture. Throughout Interstate's diversified, 100% war production activity, the unremitting demand is for absolute precision, unquestioned reliability.



Where Fine Finish and Close Tolerance Are Demanded Interstate Aircraft Uses the SUNNEN PRECISION HONING MACHINE

Shown in the photograph above are three typical examples of many jobs the Interstate Aircraft and Engineering Corporation hones on the Sunnen Precision Machine. On the machine farthest from the camera the operator is honing a body for a tank hoist reservoir assembly made of Dural stock. Tolerance is plus or minus .0005", finish must be within 10 micro inches.

On the center machine a body of a hydraulic brake balance relief valve is being honed. Tolerance and finish are the same as above. On the machine nearest the camera a housing for a C-54 landing gear strut is being honed. The material is c.m. steel No. 4130, tolerance, plus .001", minus .000"; finish, 10 micro inches.

Parts of all kinds of material, including Dural bronze, soft steel, normalized, heat treated, and tool steels—all are honed with excellent results.

Here are a few facts about the Sunnen Precision Honing Machine that make it so valuable to hundreds of manufacturers like Interstate: Hones and finishes internal diameters from .185" to 2.625"—with a guaranteed accuracy of .0001"—and a super-smooth finish—can be used in ferrous or non-ferrous metals, plastics, ceramics, etc.—accurately duplicates sizes—does not require skilled labor—can be set up in one minute—no jigs or fixtures are needed.

Yet with all these advantages the machine is low in cost. Let a Sunnen engineer give you complete information—or write for a complete catalog.

SUNNEN PRODUCTS COMPANY

7941 Manchester Avenue
St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

SUNNEN

Typical Jobs

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.

Bearing. A very small part. 2 micro-inch finish necessary.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

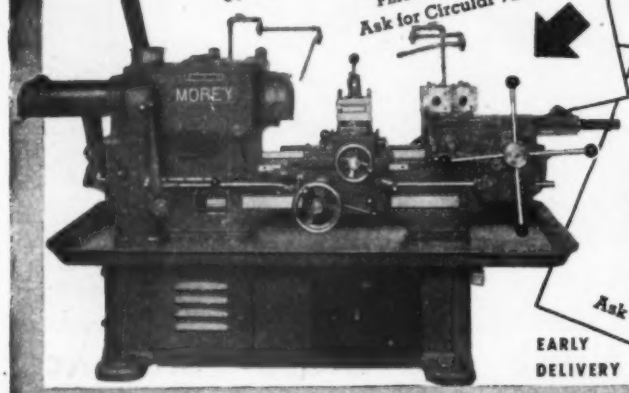
Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



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- DIFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (pulleys applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
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- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

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The value of a little machine in a busy toolroom is measured by its adaptability to the continuous variety of small jobs . . . and the speed and accuracy of performing them. The Linley saves larger machines, earns profits two ways, because of these features:

1. 8 spindle speeds from 275 to 4250 r.p.m.
2. Quick set-up . . . easy change-over.
3. Direct micrometer setting, velvet feed.
4. Ample table size, 7"x17½".
5. Small floor space, 18½"x20".
6. Accurate, fast production.

Ask us for quotation and delivery date . . . get your order in for present rush work and for your future civilian production.

BULLETIN ON REQUEST

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BRIDGEPORT 1, CONN.

The "PRODUCTION" Type A
High Speed Centerless Feed
POLISHING MACHINE
OFFERS 8 MODERN FEATURES

1—Power feed attachment, can be used for finishing tubes and cylindrical pieces

2—Adapted to a wide variety of materials and work, both cylindrical and flat

3—No centering or chucking—just feed automatically

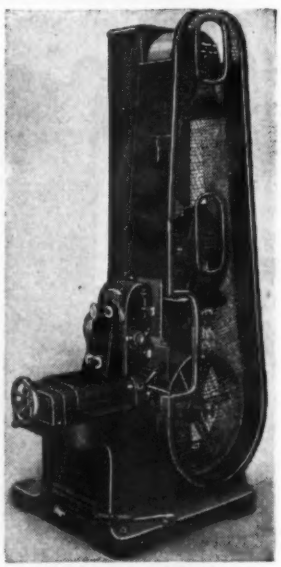
4—Employs Duplex System of Two Belts—assuring highest speed and superior finish with adequate chip clearance

5—Automatic belt tension for abrasive and cushion belts

6—Provision for alignment of both cushion and abrasive belts

7—Equipped with Timken Taper Roller Bearings

8—New powerful feeding unit assures accurate work and is provided with regulation of feed speed



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—PRODUCTION MACHINE CO.—

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

"WE EXPECT *MORE* COMPETITION

in post-war years, and will have to do our work cheaper, better, and in greater quantity", says a prominent production executive. Right! Post-war competition will be more aggressive than ever before known in this country of free competition.

Victory in this coming battle of production will go to those who have the foresight to plan — now — operating policies and mechanical equipment for the greater machine efficiency and increased output per man-hour that will be demanded.

LET US HELP YOU PLAN YOUR RETOOLING

Though civilian production will involve holding work of shapes far different from those now being handled, construction of special work-holding devices can be avoided in many ways; for example, by use of two-piece jaws with soft blank top-jaws machined to the required form.

This is but one of many seemingly small details that can be combined to save set-up time, reduce tooling cost and cut machining costs . . . thus materially strengthening your post-war position.

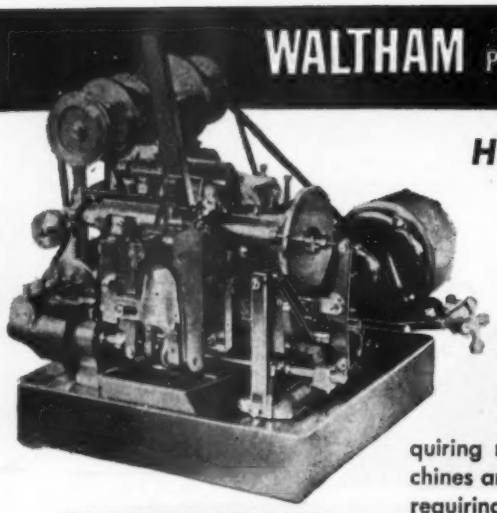
Our engineering department is genuinely anxious to assist forward looking production men in solving new work-holding problems.

THE CUSHMAN CHUCK CO.
HARTFORD 1, CONN.

A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS

WALTHAM PINION & GEAR CUTTING MACHINES

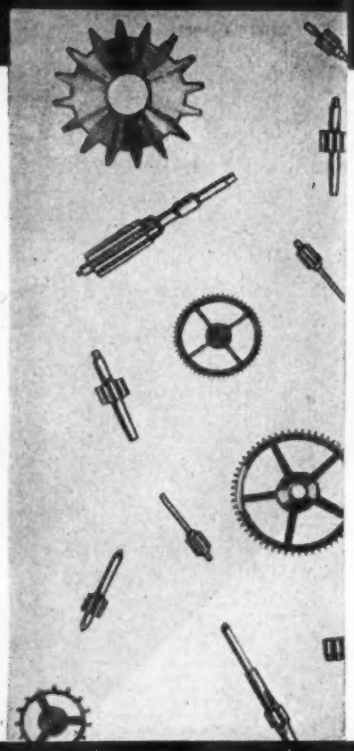


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

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150mm, 250mm, 300mm, 600mm available from stock or on short delivery.

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10" 18" 24" Range
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Base and slider of Height Gages rust-proofed by attractive deep penetration—Black Magic Finish.

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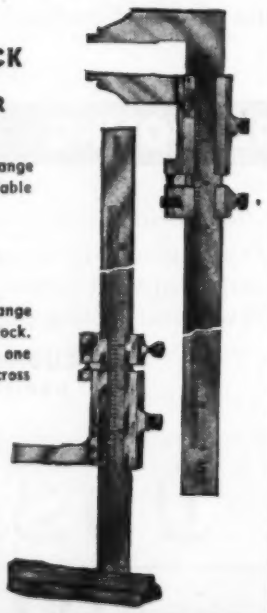

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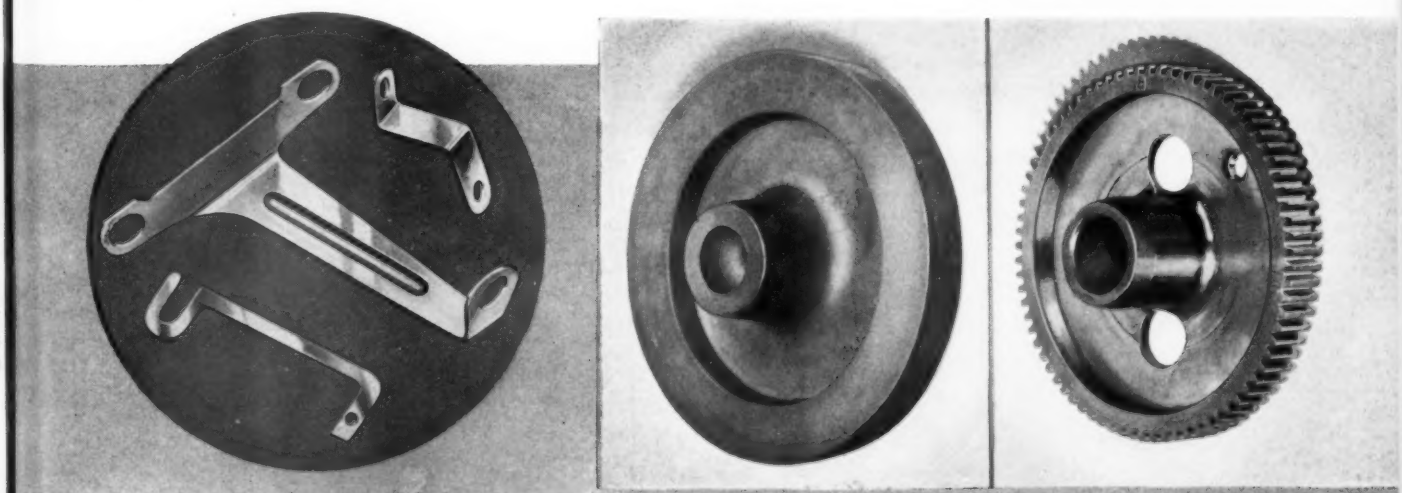
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

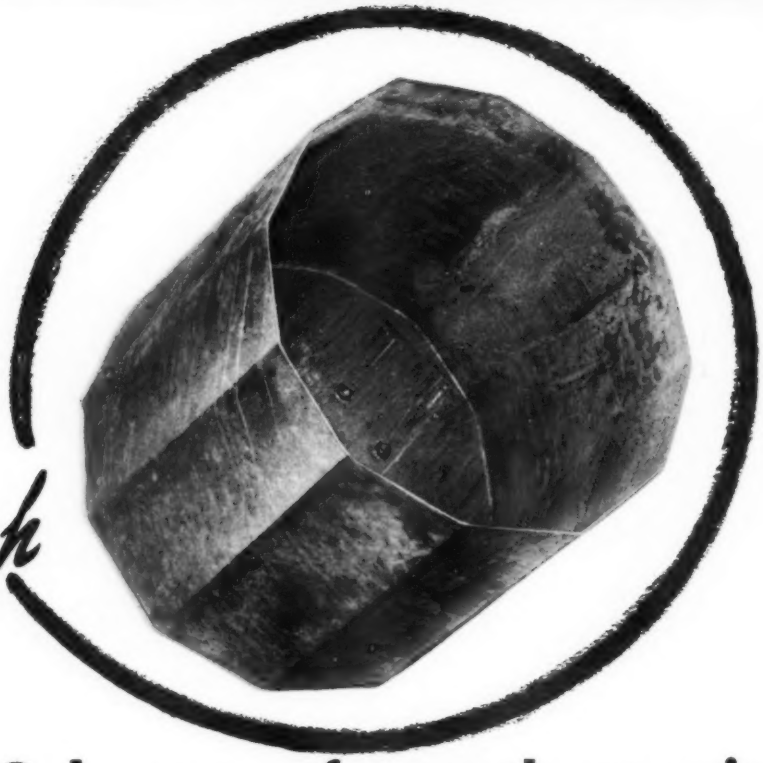


Above: Electrical contacts of Beryllium Copper. This Anaconda Alloy can be worked in the soft annealed state, then strengthened and hardened by heat treatment. It possesses excellent spring properties, high tensile strength and endurance limit, in combination with good electrical conductivity.

Above: Magneto timing gear machined from hot pressed Avialite* forging. This aluminum bronze alloy, developed by The American Brass Company is strong, tough and highly resistant to corrosion. *Reg. U.S. Pat. Off.

ANACONDA

Anaconda Copper & Copper Alloys



Proof Enough

...in 50,000 hours of tough service

The Independent Nail & Packing Company of Bridgewater, Mass., "Manufacturers of Special Wire Nails", was plagued with tumbling barrel trouble in the plating room—up until seven years ago. This is the way Mr. H. James Stone tells the story:

> "A little over seven years ago we installed our first Everdur oblique tumbling barrel in our plating room. Prior to that time we had been using wooden barrels and composition cast brass barrels, neither of which gave us good service. Wooden barrels wore out very quickly on sharp work like ours, and composition barrels were attacked by the strong acid and alkaline solutions which we use in our cleaning and polishing process.
>
> "Since 1937 we have installed an entire battery of Everdur barrels and now have additional barrels in process of construction. We are glad to tell you that our first Everdur barrel which was installed in the spring of 1937 gave us seven years of satisfactory service, in practically continuous operation 24 hours a day, tumbling our work in preparation for electroplating. The barrel was filled with the various acid and caustic solutions customarily used in plating rooms. Considering the large tonnage handled, we are greatly pleased with its long life."

Thank you, Mr. Stone. Other reports in our files tell a similar story—that tumbling barrels made of Everdur* Metal give long, economical service. 45160

THE AMERICAN BRASS COMPANY

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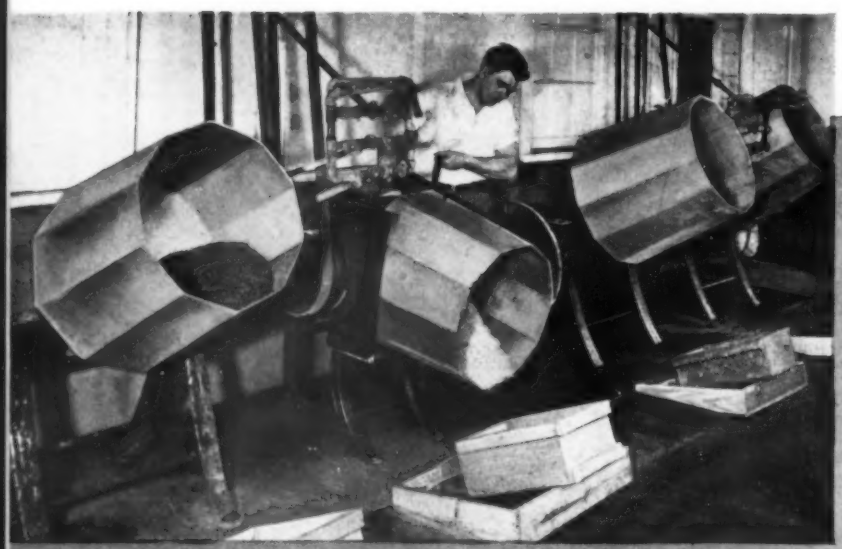

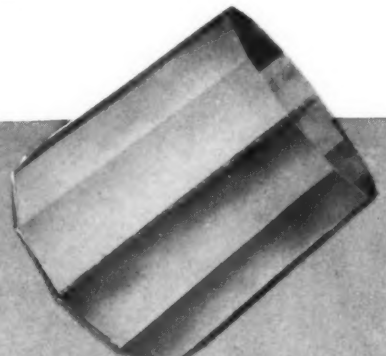

Top of page: Unretouched photograph of Everdur tumbling barrel after 7 years of almost continuous operation. ***Above:*** Oblique tumbling barrel fabricated of ¼" thick Everdur Metal by Massachusetts Engineering Co., Inc., North Quincy, Mass. The three sections are joined by carbon arc welding with Everdur welding rod. ***Left:*** Everdur barrels in the plating room of Independent Nail & Packing Company.

ANACONDA

Everdur Copper-Silicon Alloy

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3024 sq. in. per min.
3-pitch DoALL Buttress

HOT ROLLED STEEL ⅛" thick
40 lin. ft. per min.
14-pitch DoALL Precision

BRASS TUBING ½" o.d.
600 cuts per min.
24-pitch DoALL Precision

MONEL METAL 3/16" thick
132 lin. in. per min.
10-pitch DoALL Precision

BRONZE CASTINGS
18.3 sq. in. per min.
6-pitch DoALL Precision

ALUMINUM CASTINGS
120 sq. in. per min.
3-pitch DoALL Buttress

MELAMINE RESIN INSULATION 1" thick
26.4 lin. in. per min.
14-pitch DoALL Precision

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10-pitch DoALL Precision

STAINLESS STEEL .031 thick
80 lin. ft. per min.
24-pitch DoALL Precision

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22.6 sq. in. per min.
3-pitch DoALL Buttress

MALLEABLE CASTINGS
48 sq. in. per min.
10-pitch DoALL Precision

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1.18 sq. in. per min.
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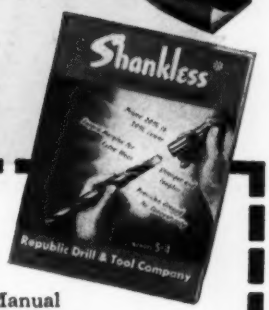

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★ Open, Unloading Type Impeller Safely Handles Abrasives

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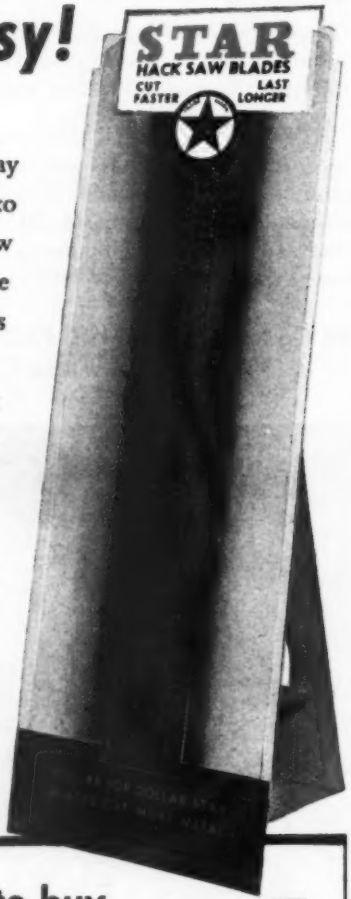
makes blade-buying *quick, easy!*



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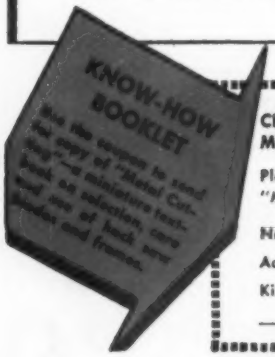

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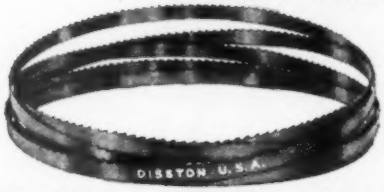

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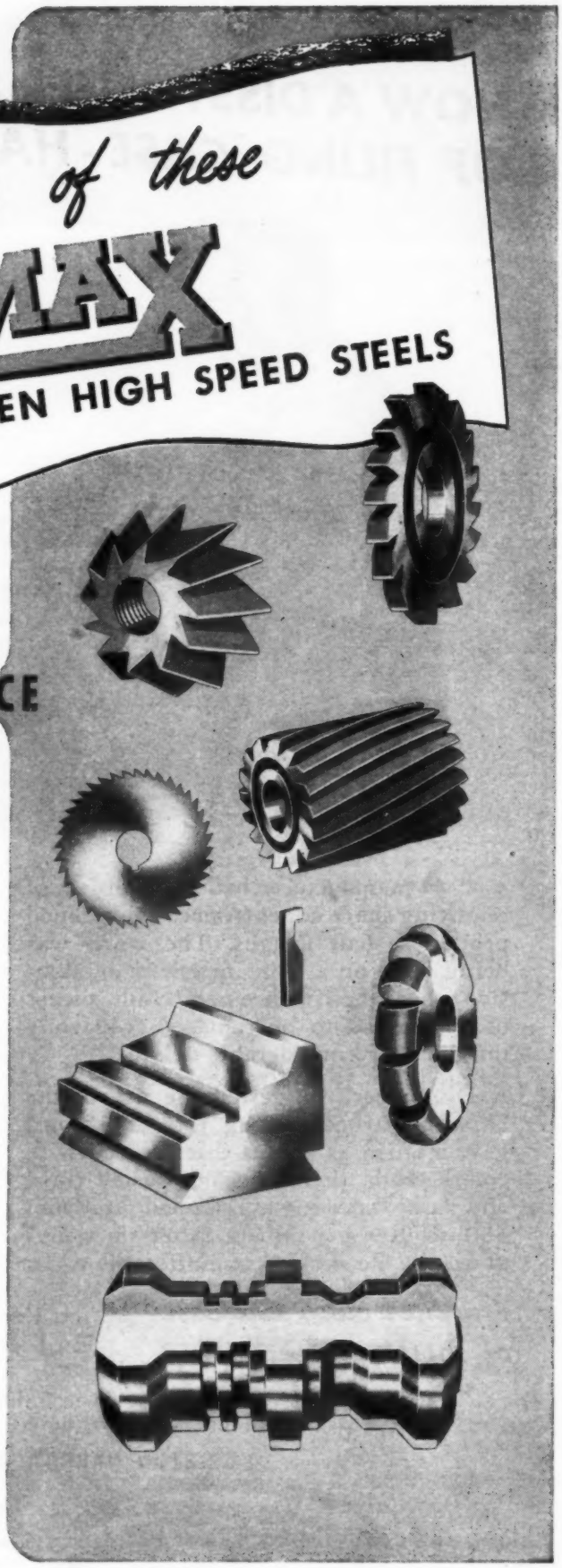

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"MOGUL"	JESSOP STEEL COMPANY
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THE CLEVELAND TWIST DRILL CO. • 1244 East 49th Street • Dept. E. • Cleveland 14, Ohio

For a Flawless THREADING JOB-

Airplane propeller nut, manufactured for American Propeller Corp., Toledo, Ohio. 4½" Diameter, 8" Pitch; modified buttress thread.

NORMALLY, the first and last threads in threading operations are imperfect threads —threads with sliver ends. But not so when this *new* Murchey is called upon to do the job. It removes the imperfect portion of the first and last threads and produces perfect threading throughout — threading without a single flaw.

Designed for faster, more accurate and perfect threading, this 32-A Thread Miller is built and geared for mass production of right or left internal or external threads 1" in diameter up to 10" O.D. inclusive and up to 12" I.D. depending on the contour of the piece (larger sizes may be obtained through consultation with our engineering department), 3" long up to ½" pitch and covering full length of thread through annular milling cutters. Completely hydraulic work cycle and a variable speed drive permits the right speed and feed for each job. Write for complete catalog to Dept. A.

MURCHEY MACHINE & TOOL CO.
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Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Thread Milling Machines. Write for literature on any or all of these.

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★ BORE
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★ COUNTER-BORE
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★ TAP
★ RECESS
★ UNDERCUT
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★ FACE
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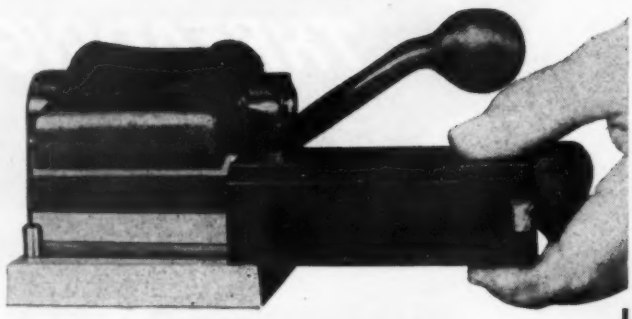
★ PART



• • • As many operations as you want—with ONE set-up—on your engine lathe, using the

Bakewell Toolholder

POSITIVE-REPEATING

For Engine Lathes

Up to 35% faster production . . . As much as 60.2% reduction in lathe scrap . . . Perfect tool position every time — Equalized three plane support — Positive stop . . . Approximately 1/12 the time to make special tool bars from Bakewell blanks . . . Holders and bars come ready for work — no machining . . . Easily installed. Rigid, compact construction — hardened and ground bearing surfaces. Truly a precision tool for fast production. Sizes for all engine lathes.

The Bakewell Toolholder was designed, developed and used in our own plant for almost two years before being offered to the trade. Parts on which we have used it required tolerances of 5/10,000 — some even closer. The Bakewell Toolholder is a finished proven speedup tool which is equally useful in production shop or toolroom. For full details write—

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Territories are now available on very favorable terms. Write today for full details.

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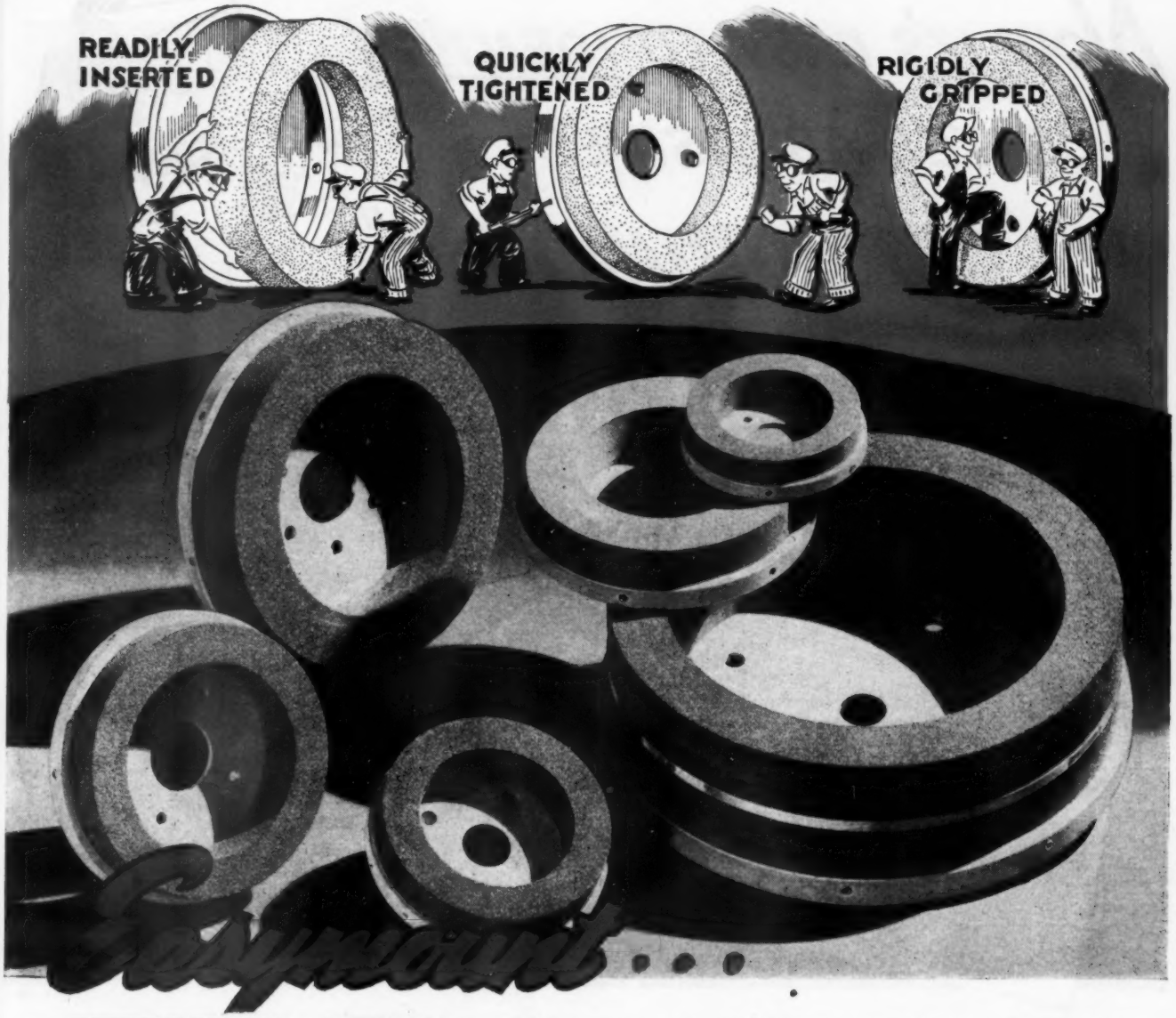

STERLING'S NEWEST "Wheel of Industry" for Expert Grinding of Steel and Tungsten Carbide Tools . . . .

New enough to offer unusual advantages . . . on the market long enough to be thoroughly tested—these are the reasons for the rapidly growing popularity of Sterling's Easymounts and Wheels for quick, easy grinding of tool steels and tungsten carbide.

The Sterling Grinding Wheel is readily placed in the Easymount and firmly retained there by an unusual assembly which does not permit the tightened screws to touch the abrasive surface.

Send for this recently issued Easymount folder . . . it's free!

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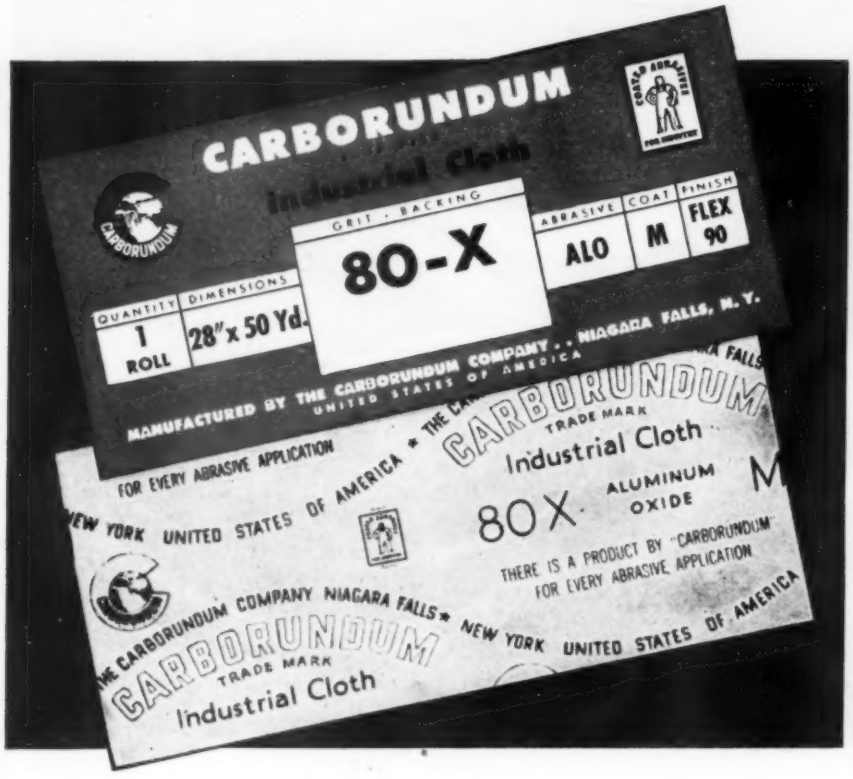
Thousands of Easymounts and Wheels of all sizes are in use . . . every one doing a better, faster, easier controlled job of grinding. They will fit admirably into your schedules, too. May we tell you more about them?

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

NOW IT'S EASY TO IDENTIFY COATED ABRASIVES BY "CARBORUNDUM"



"CARBORUNDUM" has put its simplified identification system for coated abrasives into effect. Now it is easy to order these products. First the product is called by its right name—the name of the end use. Second that name and the specifications appear on *both* the package label and the backing material. The man in the shop can easily tell what he is using and requisition more. The stockroom finds it quicker and easier to locate the requisitioned material. The purchasing department eliminates trouble in duplicating previous orders. For complete information, please refer to our new, authoritative coated abrasives book, "Sanding & Finishing." If you have not yet received your free copy, please write The Carborundum Company, Niagara Falls, New York.

THERE IS A PRODUCT BY

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FOR EVERY ABRASIVE APPLICATION

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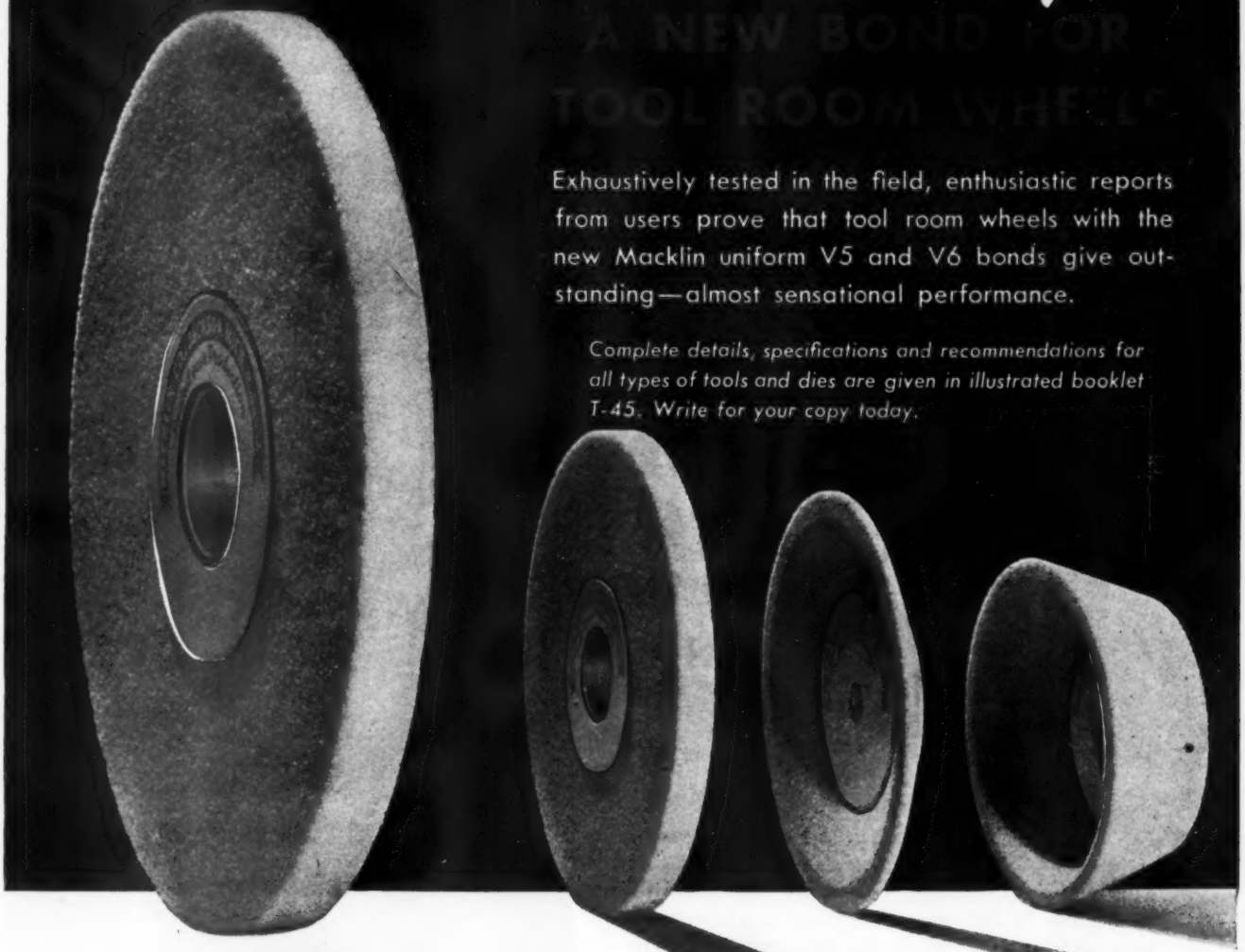
Announcing!

A NEW BOND FOR TOOL ROOM WHEELS

Exhaustively tested in the field, enthusiastic reports from users prove that tool room wheels with the new Macklin uniform V5 and V6 bonds give outstanding—almost sensational performance.

Complete details, specifications and recommendations for all types of tools and dies are given in illustrated booklet T-45. Write for your copy today.



MACKLIN

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***Manufacturers of* GRINDING WHEELS**
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WORLD'S FIRST
Controlled-Conditions Plant

*SIMONDS
gives you these 4 Unique Values in any type of METAL-CUTTING BAND SAWS

Simonds makes a special steel . . . *makes it extra-tough* . . . for use in Simonds Metal Bands. And Simonds shapes and mills the teeth for longer life. What's more, the teeth are set exactly even on both sides of the blade . . . which means clean cutting and easy operation. And finally, Simonds Hard Edge Band Saws are *welded* into a joint of ample strength to stand any stress that can be imposed on the saw.

Have your dealer advise you on the selection of the proper Simonds Metal Band Saw for *your* work. Or write direct to the nearest Simonds office listed here.

*SIMONDS (rhymes with "diamonds") is the name of the longest-experienced U. S. firm of saw-makers. Also makers of machine knives and files.

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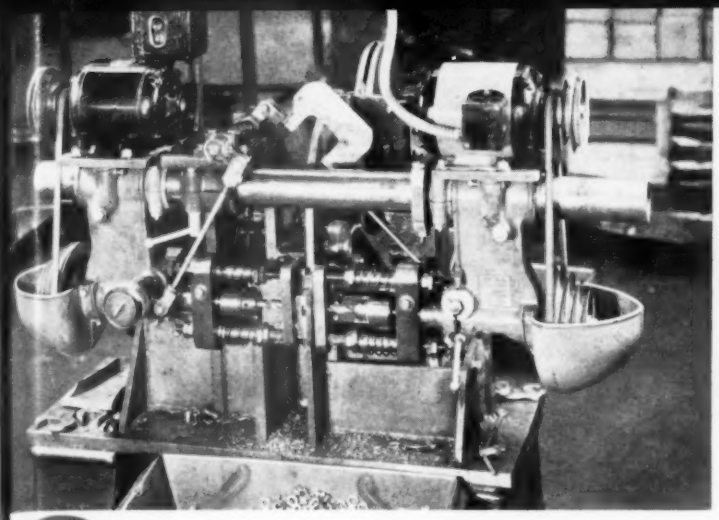
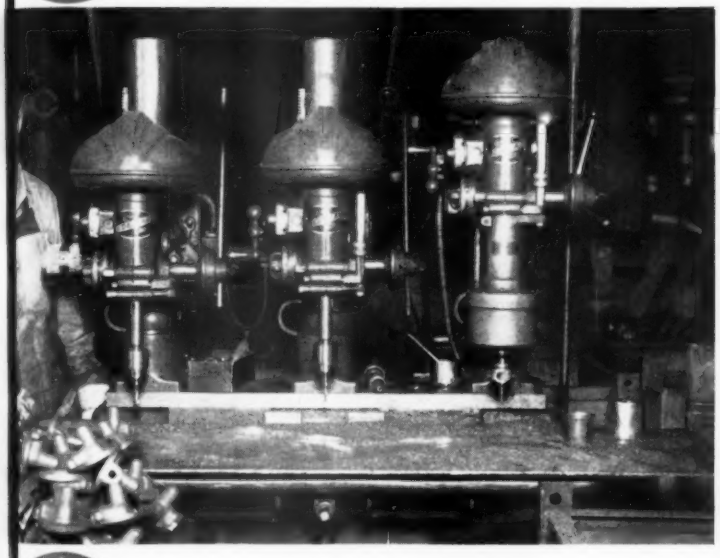
PRODUCTION TOOLS
FOR CUTTING METAL,
WOOD,
PAPER, PLASTICS

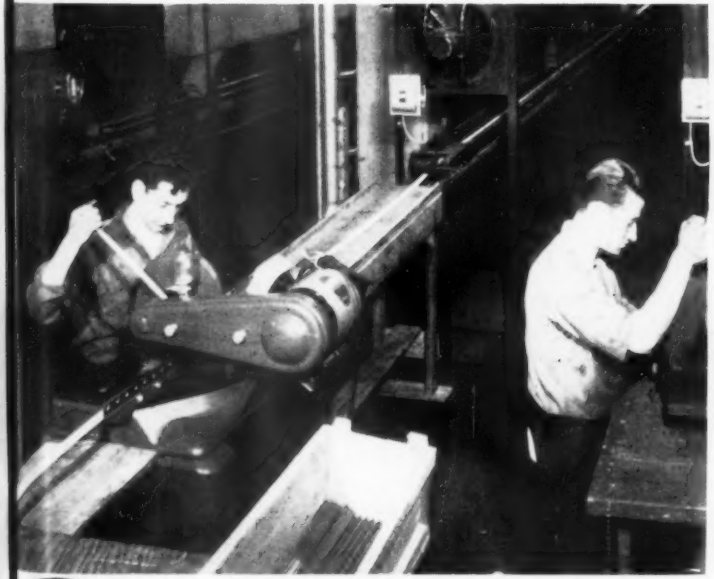
SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASSACHUSETTS



1 Save the extra cost of special machines, by building your own high-production, specific-purpose units out of standard Delta components.



2 Make old machines useful — economically — by replacing worn-out assemblies with stock-model Delta components.



3 Utilize the portability and compactness of Delta-Milwaukee Machine Tools, to revise or supplement production-line layouts for increased man-hour output.

money-saving ideas on RETOOLING ...with flexible, low-cost

Delta

MILWAUKEE

REG. U. S. PAT. OFF.

Machine Tools

TURN THE PAGE

The flexibility and low cost of Delta-Milwaukee Machine Tools help you cut your investment risk

Delta
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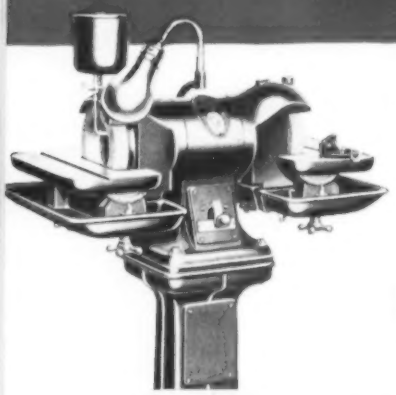
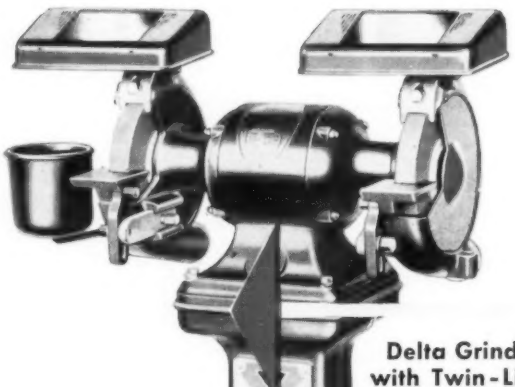
Machine Tools



Delta Carbide Tool Grinder

Combined with the Delta Standard tool grinder for hogging down the shank steel, this vibrationless unit gives you a perfect working combination for sharpening tungsten carbide tools, with a remarkably small initial investment.

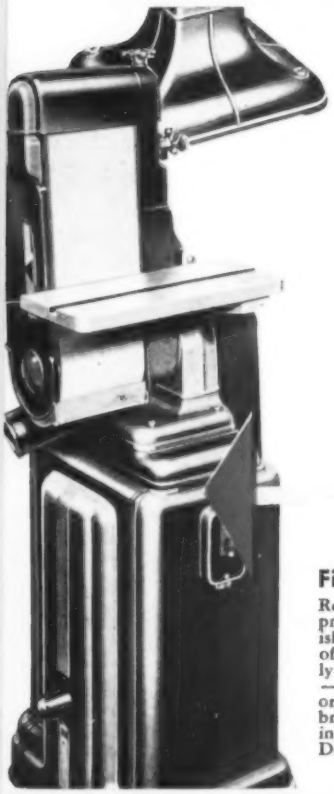


Delta Grinder with Twin-Lite* Safety Shields

Safety glass shields are built right in! Both wheels are flooded with light, to assist accurate tool grinding. Easily-adjustable, machined tool rests. Balanced wheels.

Delta 14" Metal-Cutting Band Saw

Saves time and money on many general tool and machine shop operations — sawing off tool, die, and fixture stock; cutting templates and similar tools; cutting almost any material from carbon steel to asbestos. Fully safeguarded.



Delta 6" Abrasive Belt Finishing Machine

Reduces cost per unit for precision finishing, polishing, edging, burring of small parts. Completely flexible in operation — can be set vertically or horizontally. Has lubricated-for-life ball bearings and other famous Delta quality features.

Delta Super-Hi-Speed Drill Press

A low-cost 14" machine for precision small-hole drilling of plastics and light non-ferrous metals. Interchangeable with standard Delta 14" model on regular 14" drill press column. Speed range of 12000 . . . 8100 . . . 5000 R.P.M. Specially-selected Jacobs chuck with drill capacity of from .025" to ¼". Spindle travel of 2¼". Head, complete with 60-cycle motor, available separately.

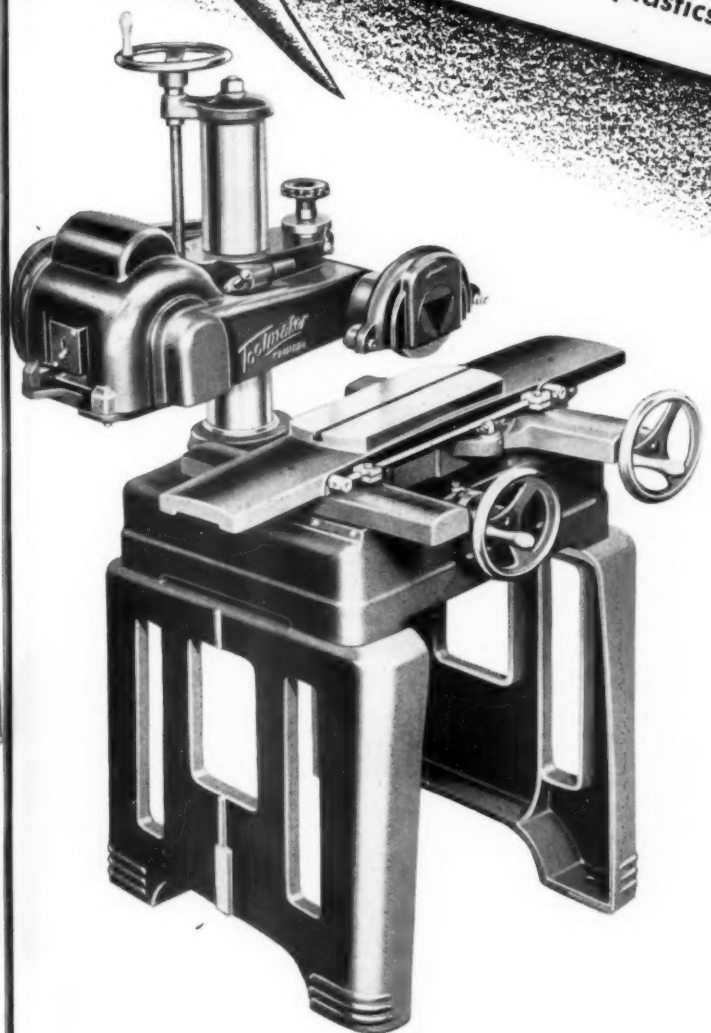
Write for free, descriptive bulletin.

Consult your DELTA-MILWAUKEE distributor

War production experience suggests economies you can enjoy in all these departments – and many more

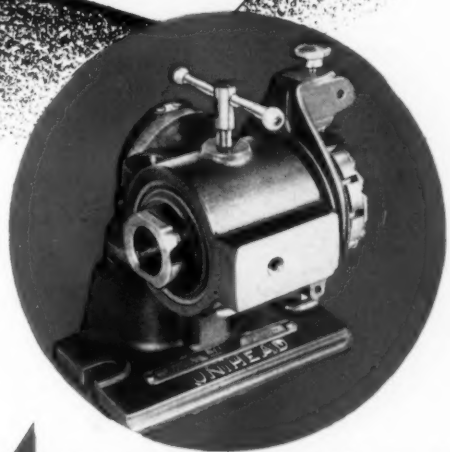
- ☑ Parts Production
- ☑ Assembly
- ☑ Tool Shop
- ☑ Maintenance Shop
- ☑ Foundry
- ☑ Pattern Shop
- ☑ Shipping Department
- ☑ Research or Experimental

. . . on a wide variety of applications in working metals, plastics, wood.



Delta Toolmaker* Surface Grinder

Low cost and portability permit this husky, big-capacity grinder to be quickly swung into any spot to free machines costing many times as much. Designed for ease and speed of surface grinding, tool sharpening, and any grinding operations within its range. Convenient controls . . . wide graduations on micrometer for close settings . . . unique wheel-adapter that saves time on truing-up operations . . . many other advantages that help assure you of creditable performance. 7" x ½" wheel; 1¼" bore. Table surface 5¾" x 13".



With the Unihead,* and the tool and cutter grinder attachment, this machine becomes the latest development in Tool and Cutter grinding. Simple, accurate, very low in cost. Delta construction features assure perfect alignment and freedom from play. Substantially built and machined to very close tolerances.

With the Univise,* the first truly universal vise for grinding, drilling, and milling — and the coolant attachment — this machine serves as a dependable, accurate Chip-Breaker Grinder for grinding the chip-breaker groove on carbide-tipped tools. Holds the tool at any conceivable angle — accurately reset at a moment's notice.

*Trade Mark Reg. U.S. Pat. Off.

regarding priorities and deliveries

TURN THE PAGE

FREE 76-page Blue Book

helps you visualize the almost unlimited money-saving applications of

Delta-Milwaukee Machine Tools

Here is a stimulating book that pictures and describes a wide range of applications using Delta-Milwaukee Machine Tools — actual, detailed case histories which give your production men a running start on your own special problems in working metals, plastics, or wood.

It may suggest — as it has in many cases — ways in which you can adopt this modern tooling practice, to save time and money.

This practical approach to the uncertainties ahead holds your capital investment to a minimum. Delta cost savings are due to modern production methods applied to a large volume of standard models—not to short-cuts in quality.

Also available is a catalog of flexible, low-cost Delta Milwaukee Machine Tools.

Request both books today . . . Use coupon below.

Tear out coupon and mail today!

M-14

THE DELTA MANUFACTURING CO.
608L E. Vienna Ave., Milwaukee 1, Wis.

Please send me my free copy of the 76-page Blue Book and catalog of low-cost Delta-Milwaukee Machine Tools.

Name.....

Position.....

Company.....

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Delta Floor-Type Multiple-Spindle Drill Presses

4-spindle model illustrated. 2-spindle model also available with one-piece table. Floor types with sectional tables: 3-, 4-, 5-, 6-, and 8-spindle models.

Delta Power-Feed Drill Presses

Worm-driven power feed gives 8 rates of feed for each spindle speed. Instantly switched to sensitive hand drilling. 17-inch single-spindle drill presses available in 24 different models.

Delta 14" Floor-Type Drill Press

Patented construction provides *both* a self-aligning drive and a free-floating spindle. Features include smooth-working table-raising mechanism, built-in depth gauge, safety belt guard, etc.

These quality features minimize depreciation of your Delta-Milwaukee Machine Tools:

1. Lubricated-for-life New Departure ball bearings double sealed against abrasive shop dust.
2. Pre-loaded bearings with unnecessary play between balls and races eliminated.
3. Precision-bored bearing seats that help keep shafts accurately aligned.
4. Balanced pulleys prevent the transmission of belt vibration to spindle.
5. Precision-ground shafts run true, smoothly, and without vibration.

Delta Cut-Off Machine

Eliminates expensive finishing. Available at a fraction of the usual cost for machines of this type. Three models — with abrasive wheel, for cutting steel; with steel blade, for cutting plastics and non-ferrous metals with polished smoothness; with cross-cut blade, for cutting wood.

S/V Sova-Quench A gives you

MODERATE QUENCHING, UNIFORM HARDNESS!

WHERE your specifications call for moderately fast quenching and uniform hardness, you can depend on S/V Sova-Quench A, for highly satisfactory results.

This Socony-Vacuum product is designed to meet "in-between" requirements...for moderately rapid but not extremely fast quenching... uniform hardness and close tolerances. It gives you good wetting qualities, low evaporation loss and little change in body with temperature variations.

For extremely fast quenching, you'll find the answer in S/V Sova-Quench R. Where great stability is a major factor, you'll want S/V Sova-Quench D, and for many jobs where no critical problems are involved, you can use S/V Sova-Quench M.

Let your Socony-Vacuum Representative study your quenching jobs, and recommend the Sova-Quench best suited to your exact needs.

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SOCONY-VACUUM'S 5 Steps to Lower Production Costs:

1. Lubrication Study of Your Entire Plant
2. Lubrication Schedules and Controls
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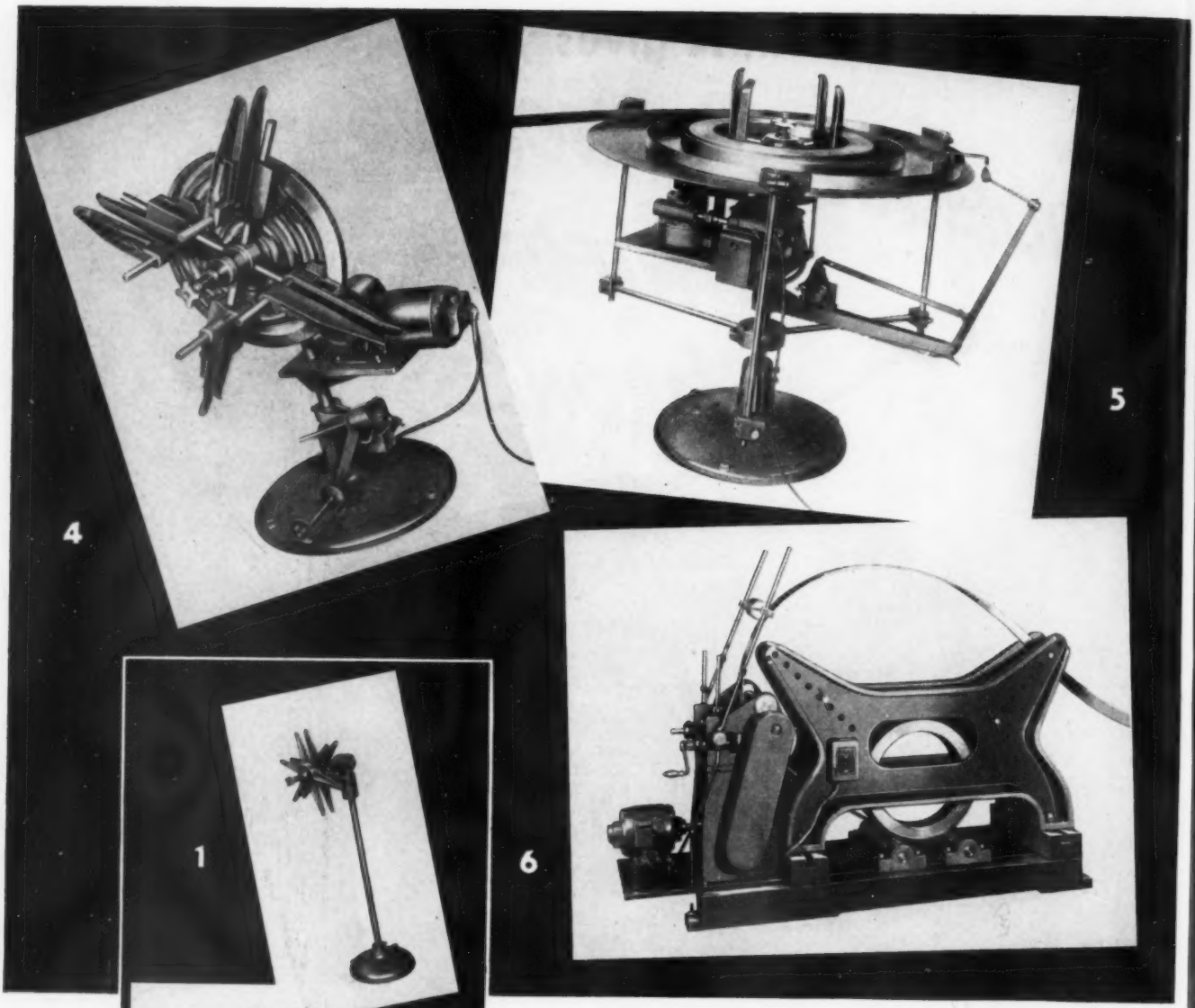
4. Skilled Engineering Counsel
5. Progress Reports of Benefits Secured

GARGOYLE Lubricants

TUNE IN "INFORMATION PLEASE"—MONDAY EVENINGS, 9:30 E.S.T.—NBC



CATALOG NEWS OF EFFICIENT

Coil Handling Equipment

Many different types of parts are now being fabricated from Coil Stock in power presses and automatic stamping and forming machines (such as the U. S. Multi Slide Machine, etc.). On this type of work, efficient coil handling equipment plays an important part in the overall economy of the set-up. The illustrations appearing in this advertisement show a few of the different types of U. S. Reels and Cradles for handling material in coils.

1. No. SR-0 U.S. PLAIN STOCK REEL (VERTICAL TYPE). For handling light coils weighing up to 100 lbs., with O.D. up to 12"; maximum width of material 1½".

2. No. SR-1 U.S. PLAIN STOCK REEL (VERTICAL TYPE). For heavier coils weighing up to approximately 200 lbs., with O.D. up to 36"; maximum width of material 4".

3. No. AR-1 U.S. AUTOMATIC STOCK REEL (VERTICAL TYPE). With motor and mercury switch control. This Reel suitable for handling coils up to 300 lbs., with O.D. up to 36"; maximum width of material 5¼".

4 No. ACR-2 U.S. AUTOMATIC CENTRALIZING STOCK REEL (VERTICAL TYPE). Similar to the AR-1 except for the addition of the centralizing feature which permits the quick adjustment of the core diameter. This Reel can handle 400 lb. coils with O.D. up to 38"; maximum width of material 6".

5. No. AR-10 SPECIAL U.S. AUTOMATIC STOCK REEL (HORIZONTAL TYPE). For holding coils of round wire or flat stock that is to be fed in a vertical position. This Reel can handle 500 lb. coils with O.D. up to 46"; maximum width of material 12".

6. No. CC-2-12 U.S. AUTOMATIC COIL CRADLE. For handling heavier coils weighing 500 lbs. and over. Maximum width of material 12". This unit is equipped with hardened ground feed rolls for automatically uncoiling the material.

U. S. TOOL COMPANY, INC.

AMPERE (EAST ORANGE) NEW JERSEY

Builders of U. S. Automatic Press Room Equipment, U. S. Multi Millers. U. S. Multi Slides, U. S. Die Sets and Accessories.

HOW DO YOU DO-

..Now That Production Is Competitive—

★ Maximum Speeds
★ Heavier Cuts
★ Heavier Feeds
★ More Pieces per Grind
★ Longer Wear

★ Cost-minded production men are sharpening their pencils like never before. Everybody who machines steel and non-ferrous metals "chooses" cutting tools by what comparative performance figures show.

Production figures under wartime conditions in one plant reveal an average increase of 14 more parts per hour on 62 different operations by use of Vascoloy-Ramet Tantalum/Tungsten Carbide Tools.

Our field representatives are ready at all times to help you in the application of the "World's Finest Carbide Tools" on your lines. Write for your copy of Bulletin VR-350A.

FOR QUICKER SERVICE TO YOUR PLANT

Complete Stocks of VASCOLOY-RAMET STANDARD CARBIDE TOOLS and TANTUNG CAST ALLOY STANDARD CUTTING TOOLS are maintained for your convenience at:

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AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM-ALLOYS STEEL COMPANY

NORTH CHICAGO, ILLINOIS • DISTRICT SALES & SERVICE IN PRINCIPAL CITIES 4532

HARD CHROMIUM

- To Maintain Accuracy and Increase Tool Life
- To Prevent Corrosion and Reduce Wear
- To Resist Heat and Eliminate Seizing
- To Reclaim Worn and Off-size Parts

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ELECTRODEPOSITED CHROMIUM offers you a *proven* means of saving time and materials; of hitting a faster production pace and improving the performance of your products. The chromium plated surface is resistant to wear, abrasion, heat and corrosion, and has a very low coefficient of friction.

Remember, United Chromium has "lived" with chromium plating since its inception. In addition, we have engineered it into the tremendous variety of applications where it has proved successful.

The wealth of knowledge we have acquired is available both to our present licensees and interested manufacturers. Why not draw upon this to determine the suitability of Hard Chromium Plating to your work? The first step is, simply, write to our nearest office outlining your problem.

OTHER U. C. PRODUCTS AND PROCESSES TO SERVE YOU

☆**UNICHROME ALKALINE COPPER** for smooth, lustrous copper plating in a non-cyanide bath.

☆**ANOZINC** salts for anodic treatment of zinc, giving greatly increased corrosion-resistance.

☆**UNICHROME DIP** for increased corrosion resistance of zinc and cadmium—without electric current.

☆**UNICHROME STRIP** for speedy removal of copper, chromium, zinc, etc.

☆ Trade Mark Reg. U.S. Pat. Off.

☆**UNICHROME RACK COATINGS**

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☆**UNICHROME Clear and pigmented LACQUERS**

☆**UCILON** corrosion-resistant coatings for protecting surfaces against acids, alkalies, water, gasoline and various corrosive chemicals.

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HERE'S WHERE YOU NEED A *Gage Engineer!*

THIS CALL will put you in direct personal touch with real tool-planning help and save precious time in answering gage questions.

Kobe, Inc., developed its business by freely offering proven engineering solutions for prospects' and customers' riddles alike and by progressively creating new products to overcome these diffculties.

Likewise, Kobe gage engineers met the toughest war demands in perfecting Gage Facilities to supply Army, Navy and top national contractors' exacting mass production requirements.

Peace also demands rapid and profit-sure tool planning and fabricating. Sound gage application is basic. A Kobe Gage Engineer is as near as your Phone. Please Call! Today!

KOBE

Master and Reference GAGES

KOBE, INCORPORATED
3040 East Slauson Avenue • Huntington Park, California

AMES No. 13 COMPARATOR

.001" Model $30.00
.0005" Model $30.00
.0001" Model $45.00

For accurately measuring large, small and odd shaped parts speedily, this No. 13 Comparator is popular and attractive. The 8" square base is ground flat on top and often fitted with V blocks, anvils and stops of various kinds. The bracket which holds the 2¼" indicator extends 4" over the base and is adjustable for measuring up to 6".

There are many uses for this inexpensive, durable, high-grade Comparator in every shop where accuracy is essential.

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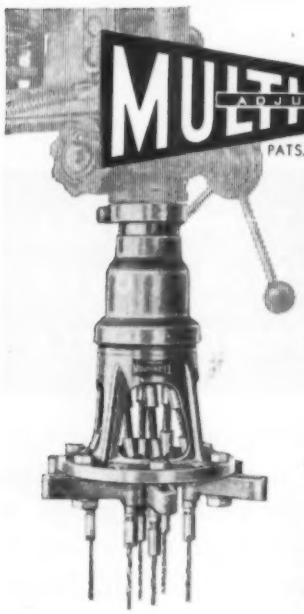
B. C. AMES CO.
WALTHAM, MASS., U. S. A.

MULTI-DRILL
ADJUSTABLE
PATS. PENDING



Drill 6 Holes at One Stroke— Adjustable for *any* Pattern!

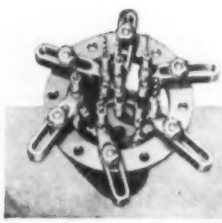
Your drill presses equipped with adjustable MULTI-DRILL heads will

- Reduce costs thru multiplying your present drill press production
- Conserve valuable floor space in your shop or departments
- Reduce your equipment investment
- Often save their cost on the first job

The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—11/16" minimum centers. Standard capacity 3/32" to 17/64" drills. Many modifications are available for your special applications at slight additional cost.

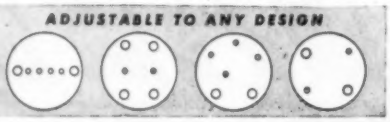
Write today for circular.

Any Hole Pattern



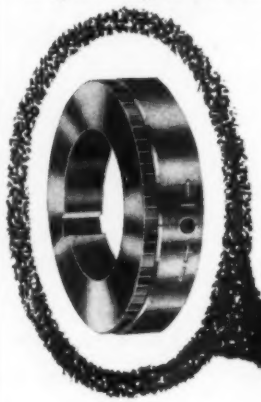
COMMANDER MFG. CO.
4229 Kinzie St., Chicago, U.S.A.

ADJUSTABLE TO ANY DESIGN



MICROMETER ADJUSTMENT

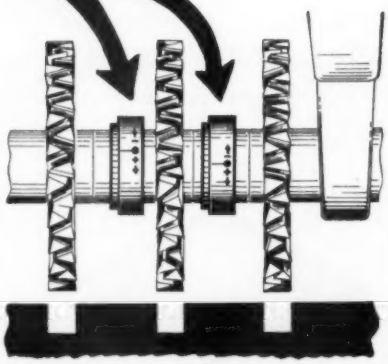
on side milling cutters and gang milling setups with Dayton Rogers Micrometer Adjustable Spacing Collars



You can make an adjustment QUICKLY — ACCURATELY on all milling machine setups with these collars by merely loosening the cutter arbor nut and making an adjustment as required. Graduated in thousandths, an adjustment of .0005" can be made very readily by visual calibration.

Made in twelve standard sizes from ⅞" to 2" for immediate shipment. Each collar furnished with spanner wrench for making adjustments.

Write for Bulletin No. 120-1.



DAYTON ROGERS MANUFACTURING CO.
MINNEAPOLIS 7 MINNESOTA

IT'S NOT ONLY *Which* CUTTING MATERIAL

BUT HOW YOU USE IT THAT COUNTS

Have you a copy of the Allegheny Ludlum "Fabrication Blue Sheet"?

Contains a wealth of reliable, certified data, not only on the machining of Allegheny Metal, but on the best methods employed in other fabrication operations on stainless steel—forming, welding, finishing, etc. Write for your copy—you'll find it highly useful and complete.

ADDRESS DEPT. AM-44

THERE'S hardly a single cutting operation that can't, in some way, be improved. Our record files contain hundreds of instances. Redesign of the tool itself often works wonders. In other cases, a switch of cutting materials shows a marked increase in production, or in pieces between grinds.

That's the job of our Mill Service organization—to work with you for improvement—and the Allegheny Ludlum line now offers you absolutely complete selection. The range extends from Carmet carbide metal blanks and tipped tools—through ALX cast alloy-metal ground bits—to DBL and Super DBL low-tungsten high speed steels, as well as the various high-tungsten and "moly" types of high speed steels. Call us in, any time, anywhere.

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IT'S because it is a collapsing tap which can be used for almost *any* make of machine and for almost *any* internal threading job over 1¼" diameter without the purchase of additional parts. Notice the fine proportions of the Geometric Class S Tap and its rugged simplicity. You can save enough time, trouble and money with a Geometric to make it pay for itself again and again. Note the four applications shown below.

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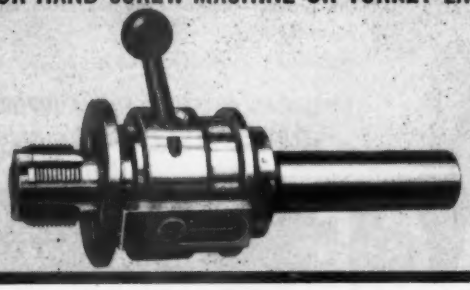
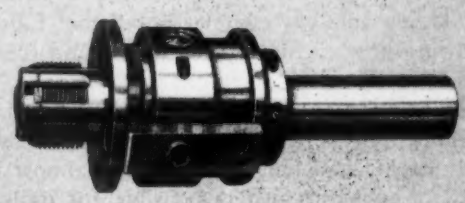


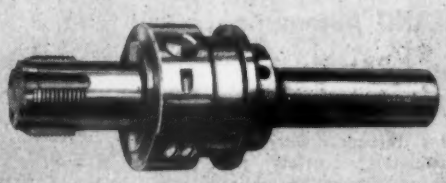
Here the tool is stationary and is tripped by the trip plate, re-set by the conveniently placed handle.

2. FOR DRILL PRESS OR ROTARY SPINDLE MACHINE



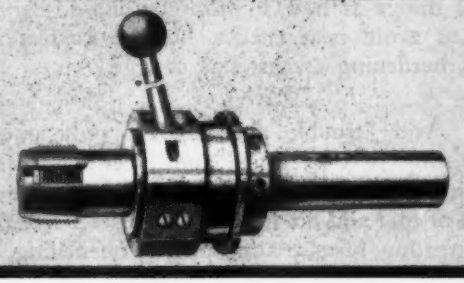
Same tool is tripped by trip plate, re-set by yoke or forked arm contacting back end of closing sleeve.

3. FOR AUTOMATIC SCREW, CHUCKING, THREADING MACHINES, ETC.



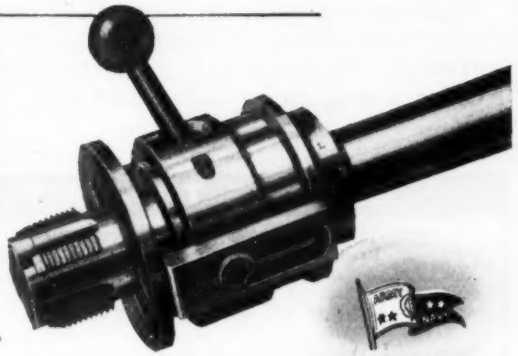
Same tool, without trip plate, with tripping and re-setting done by yoke fitted into the closing sleeve.

4. FOR SHORT RUNS, SIZING, ETC.



Same tool, but here it can be tripped and re-set completely by hand.

Put Geometric Class S Collapsing taps to work for you. Each size of tap cuts a wide range of diameters and pitches. Chasers are easy to adjust or re-sharpen. These Geometric Class S Collapsing Taps will give long, trouble-free, cost-reducing service in your plant as they are doing in hundreds of other plants today.



FOR DETAILED DESCRIPTION OF THIS TOOL WRITE FOR S TAP BOOKLET

The GEOMETRIC TOOL COMPANY
New Haven 15 Connecticut

A DIVISION OF THE GREENFIELD TAP and DIE CORPORATION

Here's Practical Help for "Trouble Shooting" Tool Failures

TOOL STEEL SIMPLIFIED

By FRANK R. PALMER
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The Carpenter Steel Company
315 *Pages* 205 *Illustrations*
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Being able to "trouble shoot" tool failures —knowing how to find what's wrong and correct it, how to spot tools that might *look* all right, but may cause unnecessary shutdowns—is particularly important now. And that is one reason why "Tool Steel Simplified" has become almost the "bible" of so many men responsible for tools.

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And "trouble shooting" is only one of many subjects covered by "Tool Steel Simplified". It contains usable, helpful information on every phase of tool and die making—tool steel selection, heat treating, furnace atmospheres, quenching, etc.

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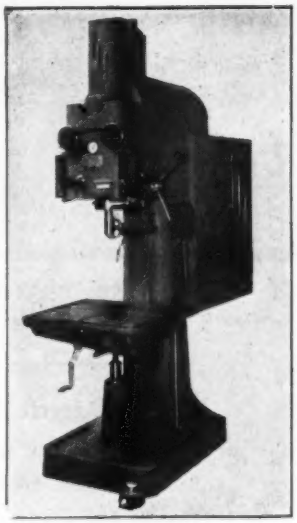

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S-5

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SAVE Time

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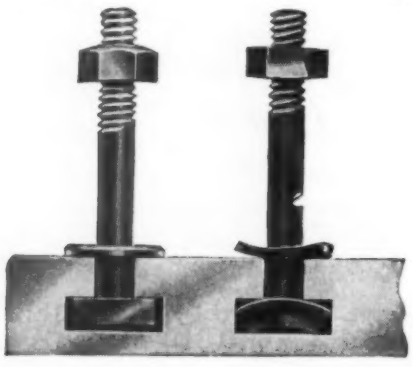

SMB BOLTS FIT SQUARELY

WORN BOLTS DO NOT HOLD FIRMLY

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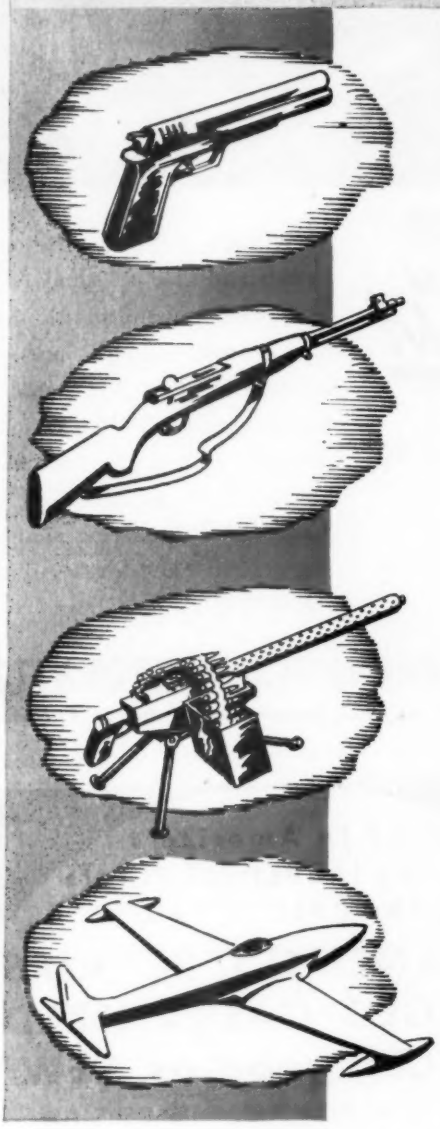

When the finishing of grooves in pistol frames was changed to broaching, one broaching machine and one operator replaced six machines and six operators . . . yet production was greatly increased. The result was faster production of a better gun at lower cost.

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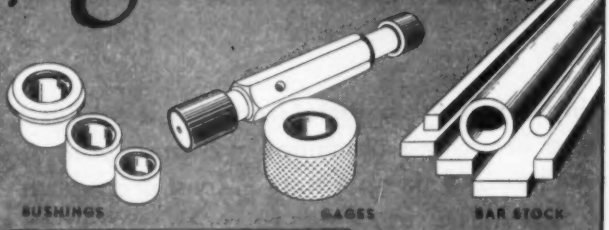

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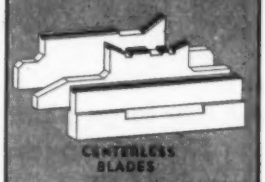
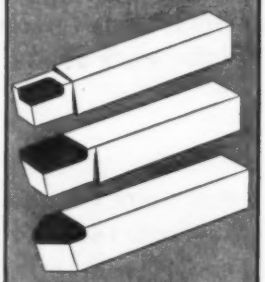
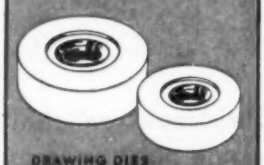

CENTERLESS BLADES


CUTTING TOOLS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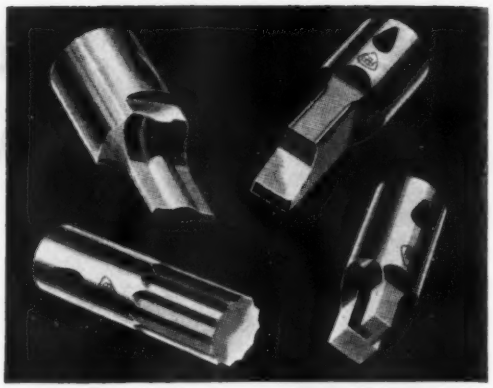

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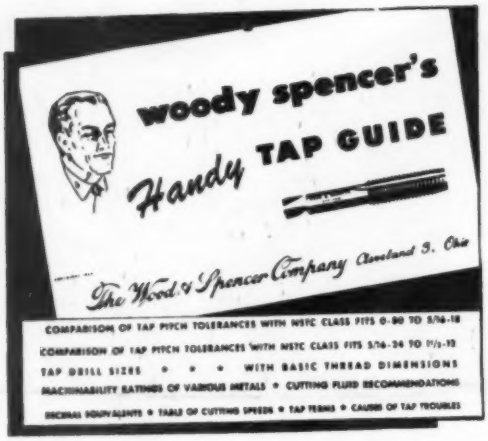
TAPPING TIPS

From Woody Spencer's Notebook

LOOK PAL—HERE'S SOME REAL TAPPING HELP

Here's a new idea I've worked up to help make tapping jobs easier. I've packed it full of all the information I could get together—all the things the boys are asking me about. *Here it is:*


woody spencer's
Handy TAP GUIDE
The Wood & Spencer Company Cleveland 3, Ohio
COMPARISON OF TAP PITCH TOLERANCES WITH NSTC CLASS FITS 0-80 TO 5/16-18
COMPARISON OF TAP PITCH TOLERANCES WITH NSTC CLASS FITS 5/16-24 TO 1"/2-12
TAP DRILL SIZES • • • WITH BASIC THREAD DIMENSIONS
MACHINABILITY RATINGS OF VARIOUS METALS • CUTTING FLUID RECOMMENDATIONS
DECIMAL EQUIVALENTS • TABLE OF CUTTING SPEEDS • TAP TERMS • CAUSES OF TAP TROUBLES

Maybe this new pin-up of mine doesn't have all the curves of some others I could name, but it does have all the angles—tapping angles I mean. It's new. It's attractive. It's colorful. And it's strong on job appeal. It shows comparisons of tap pitch tolerances with NSTC class fits. It shows tap drill sizes, basic thread dimensions, machinability ratings of various metals, cutting fluid recommendations, recommended cutting speeds, decimal equivalents, tap terms and a lot of the common causes of tap troubles. And the whole thing is indexed and arranged for quick, easy reference. Just lift the tab and there's your information. It's designed to hang up on the wall in the tool crib, in the shop or the engineering department. I think everyone interested in tapping is going to find it mighty handy. *And, of course, it's FREE.*

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Cleveland 3, Ohio

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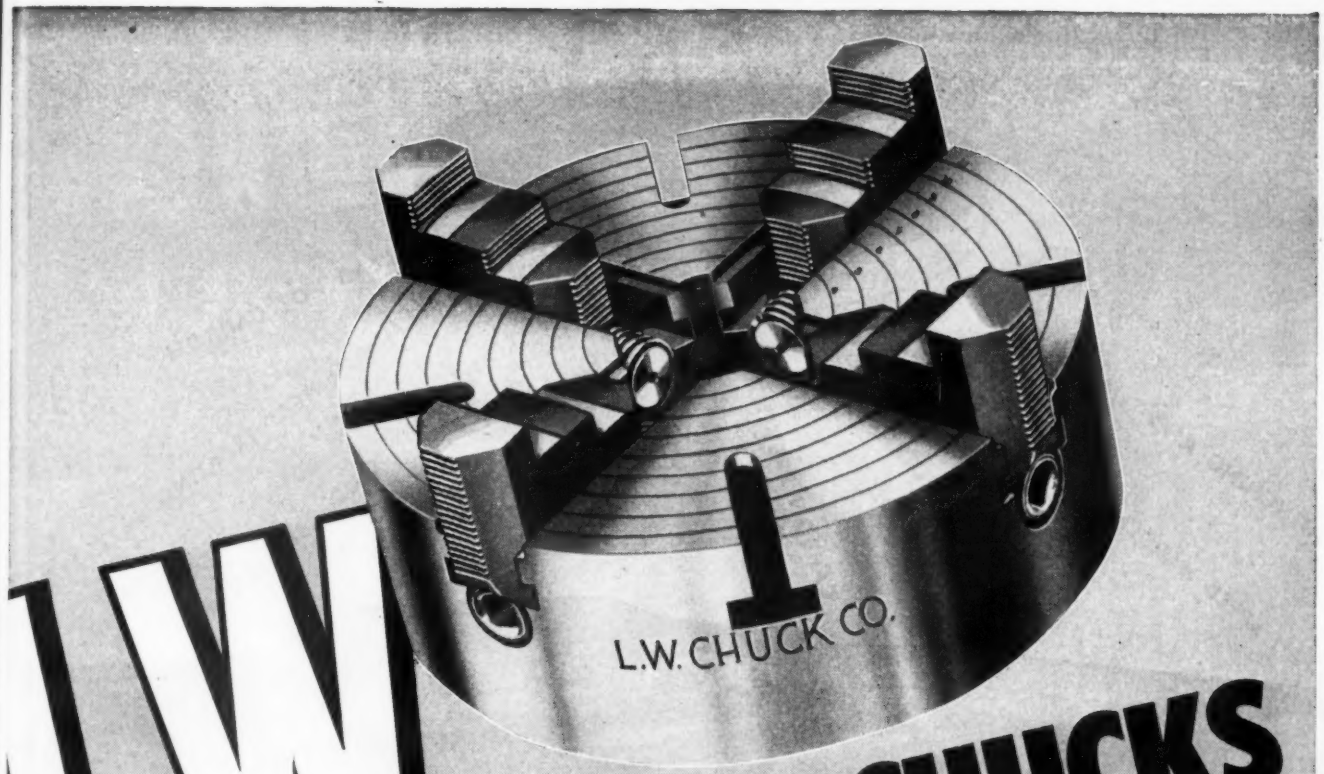

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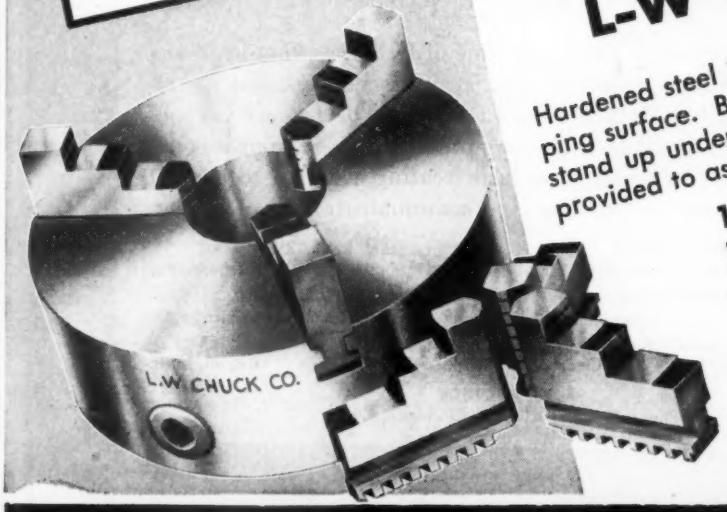

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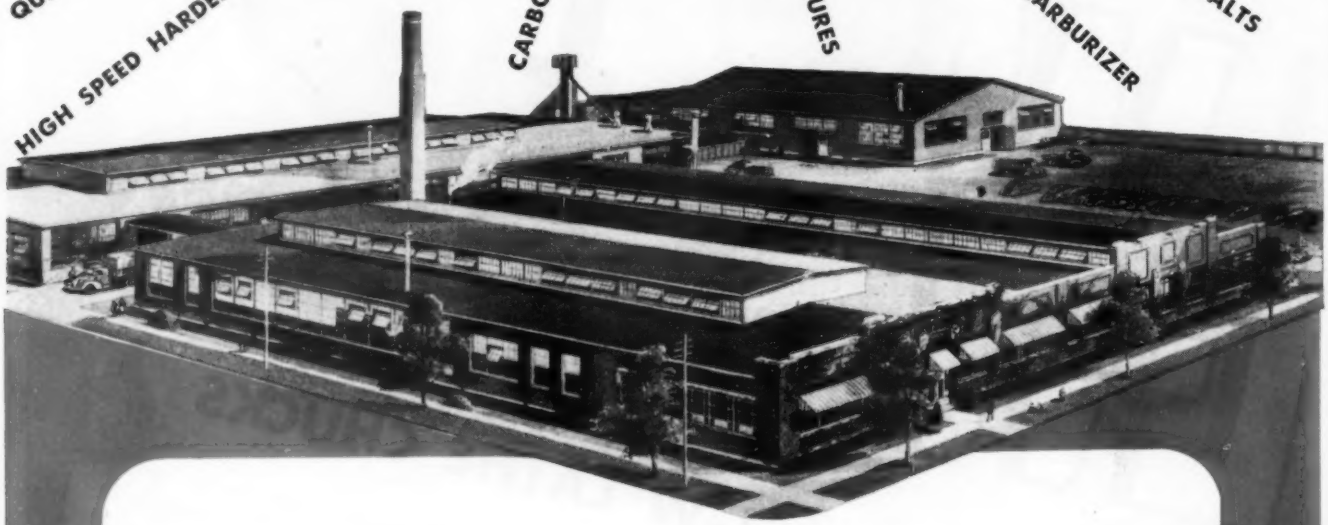

The Park Chemical Company offers manufacturers a complete line of Heat Treating Products that are Laboratory Controlled under the supervision of their staff of chemists and metallurgists. These products are serviced by Park's Metallurgical Engineers. Their many years of experience in solving heat treating problems are at your service. When you have a problem on heat treating, feel free to consult our engineer in your territory or communicate with us direct.

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SIEWEK *Announces*

2 New MIDGET-SIZE...

Actual Size Illustration

Rapid Clamping Drill Jigs

(PRECISION BUILT)

NO. 4900
Work area 1⅛ x 2 inches

NO. 4950
Work area 1½ x 3 inches

This is the standard jig that many industries have been waiting for. *It's small in size and precision-built.* Made in two sizes. Both of these new model midget-size Siewek Jigs are designed for work where speed, accuracy and precision are essential.

A powerful positive lock holds the work securely between two accurately parallel surfaces. Top plates are interchangeable. A new top plate, with appropriate bushing, provides a *new* jig for each operation—at a fraction of the cost of a new unit.

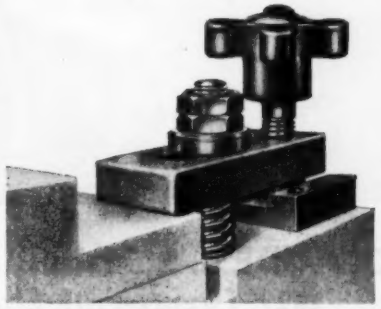
Siewek "midgets" can be used as "tumble" jigs—either vertically or horizontally. Handle and lock are quickly interchangeable for either right or left hand operation.

Send for complete description and dimensional drawings. Prices: *No. 4900: $39.50 net; No. 4950: $42.50—f. o. b.* Feandale, Michigan. Extra top plates: $4.50 each.

Manufacturers of

SIEWEK

Clamps and Fittings



SIEWEK TOOL DIVISION • DOMESTIC INDUSTRIES, INC.,

231 SOUTH LA SALLE STREET **CHICAGO 4, ILLINOIS**

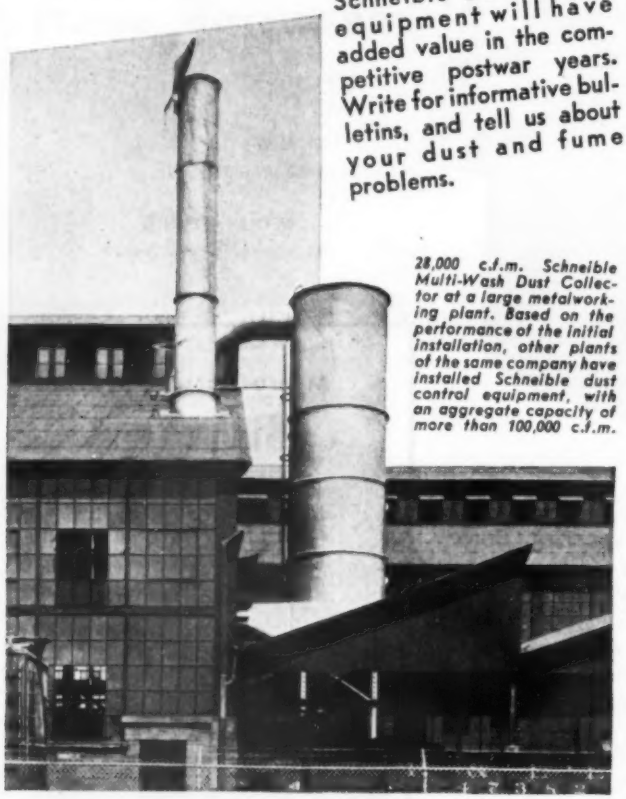
Over 12,000,000 Cubic Feet of Clean Air Per Minute!

The more than one thousand Schneible Multi-Wash Dust Collectors now installed, if operated simultaneously, would completely remove dust and fumes from 12,000,000 cubic feet of air per minute.

This impressive total reflects the increased acceptance of the proven wet method of dust collection. A preponderance of industries with outstanding war production records are now equipped with Schneible Multi-Wash systems. The importance of maintaining clean air continuously in the working zones in these plants has been given recognition as never before, and only the most dependable and trouble-free equipment has been installed.

Schneible Multi-Wash Dust Collectors provide clean air at its best, and at the lowest ultimate cost. Attendance and maintenance are reduced to an absolute minimum, as there are no parts which break, burn, clog, rapidly wear, or require periodical cleaning. The collected matter, as sludge, permits far more easy disposal than an accumulation of dust.

These advantages of Schneible dust control equipment will have added value in the competitive postwar years. Write for informative bulletins, and tell us about your dust and fume problems.



28,000 c.f.m. Schneible Multi-Wash Dust Collector at a large metalworking plant. Based on the performance of the initial installation, other plants of the same company have installed Schneible dust control equipment, with an aggregate capacity of more than 100,000 c.f.m.

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2827 Twenty-Fifth Street
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ERRINGTON MECHANICAL LABORATORY

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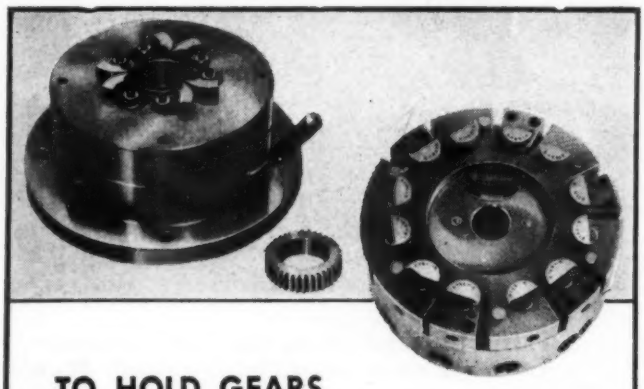
Fixed-Center Auto-Reverse Multiple Tapping Heads
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD



TO HOLD GEARS
with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

MATCH-IT GEAR CHUCKS

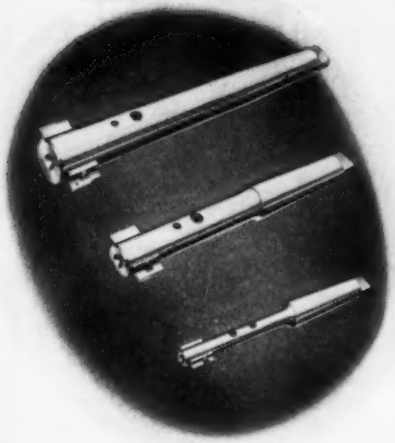
Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

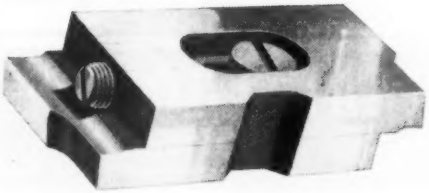
Send for catalog

LeMaire Tool & Manufacturing Co.
2665 So. Telegraph Rd., Dearborn, Mich.

4 REASONS WHY MADISON REAMERS CUT TIME AND COSTS

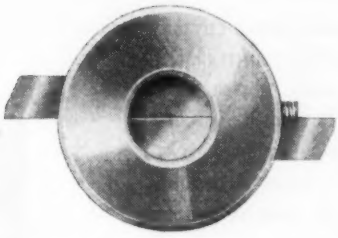
The simplified design and operational features of Madison Production Reaming Tools will enable you to cut your reaming time and hole costs to the minimum. Easy to adjust, to maintain and always aligned, the free, smooth cutting action of Madison Reamers has provided the answer to industry's need for greater speed and economy in reaming operations. Check the four reasons for Madison efficiency listed below.





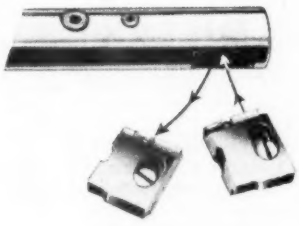
MIRROR-SMOOTH FINISH

The cutting blades of a Madison Reamer produce a mirror-like finish that in most cases does not require an additional finishing operation. Since Madison cutters are pre-sized, any number may be stored in a crib. The Madison one-screw adjustment feature insures that both blades always cut, by eliminating possibility of unequal cutter blade expansion.



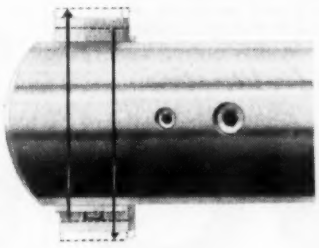
BETTER CHIP CLEARANCE

Because Madison Reamers have no multiple inserted blades, there is more room for chip clearance and circulation of coolant. Thus, danger of clogging and resultant overheating is eliminated, and shrinking or tapering of the hole prevented. Further insurance against hole distortion is provided by Madison's freer cutting action, which permits work to be held very lightly. This makes Madison Reamers ideally suited to the machining of the new, lightweight metals.



INTERCHANGEABILITY

Since Madison cutters are pre-sized, they are interchangeable in Madison bars. A sharp cutter can be inserted in a Madison bar in a matter of seconds without disturbing the original set-up. Keeping a sharp cutter in operation at all times assures more continuously uniform work and the holding of required tolerances. The two-bladed Madison cutter will naturally require less maintenance time.

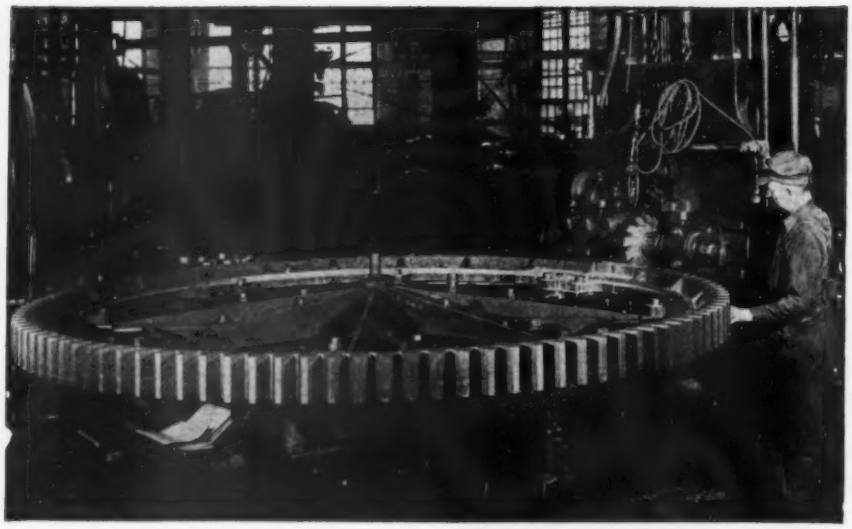


CONTROLLED FLOAT

Because the Madison cutter is floated in its bar at the exact point where the cutting action takes place, float can be better controlled and indicated for greater uniformity on long-time production jobs. Chances for bell mouth and bar wobbling are eliminated. No special floating tool holders and chucks are necessary.

MADISON
MANUFACTURING COMPANY
DEPT. A-4 MUSKEGON, MICHIGAN

Madisons are used for rigid or float reaming on lathes, drills, millers and special machines. Used on hard and soft metals and plastics. Write for the Madison catalog — lists complete lines, prices and grinding instructions.



"David and Goliath"

NATIONAL TOOL PRODUCTS

BROACHES • HERRINGBONE CUTTERS
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REAMERS • GEAR SHAPER CUTTERS • GEAR CUTTERS • MILLING CUTTERS • CIRCULAR AND FLAT FORM TOOLS • HOBS • GROUND AND UNGROUND SPECIAL TOOLS

National Tools are the Shapers of Progress

From Blueprint to Product

At the Marion Steam Shovel Company, Marion, Ohio, where power shovels are built from ¾ cu. yd. to 35 cu. yards capacities, huge dimensions at precision tolerances are commonplace production practices.

To assure that close tolerances are preserved on the modern "Goliaths" of steel which form a Marion machine, tools selected must measure up to the tremendous job before them. Thus we see little "Davids" in the shape of modern National Tool cutters mastering huge gears 118-10" in diameter with 140 teeth and doing it to close gear limits.

The huge gear illustrated here is the main rotating gear for the Marion 4161 electric shovel. This shovel is popular in copper mines where many of them are working in the country's foremost open pit mines on a twenty-four-hour schedule.

NATIONAL TOOL Co.
11200 MADISON AVENUE CLEVELAND, OHIO

MARKING MACHINES
STEEL DIES—TYPE AND FIXTURES

Matthews marking machines, dies, type and fixtures supplied for marking names, codes, trade names, trade marks, patent numbers, etc., on all types of industrial parts or products.

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Flat Die for Marking Round Parts

Round Die for Marking Flat Parts

Roller Die with Interchangeable Type

No. 204 Marking Machine

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District Sales Offices: Cleveland, Hartford, Birmingham

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

AO "Sta-Set" Finger Cots

Provide Rugged Protection without Impairing Touch Sensitivity

The new AO 8x141 "Sta-Set" Finger Cot is made of selected grain leather and is especially recommended for use wherever sensitivity of touch is an important factor, such as in soldering fine wire assemblies.

It is scientifically designed, cut and constructed to meet four major requirements:

1. *Protection.* These new finger cots afford rugged protection to both front and back of fingers.

2. *"Sta-Set" Design:* They are designed to *stay* in place on the finger. It's practically impossible to turn or twist them, even under the roughest usage.

3. *Flexibility:* Soft, pliable leather, plus an elastic strap in back at bottom allows complete freedom of movement.

4. *Convenience.* Design allows for complete ease and convenience in putting on and removing cots.

AO 8x142 "Sta-Set" Finger Cot, made from high grade chrome tanned cowhide leather, is recommended for jobs involving especially hard usage—such as polishing, burring, grinding small parts, etc.

Both Finger Cots are available in three sizes—small, medium (or standard) and large.

Packed in boxes of 100 of one size only. Write or phone your nearest AO Branch Office.

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DRUMS! DRUMS! DRUMS!

War needs make it imperative that all empty drums be returned immediately.

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TYCOL INDUSTRIAL

ENGINEERED FOR EVERY

take a Big Jump

TYCOL ENGINEERED CUTTING OILS

. . . for heavy duty and aluminum cutting jobs

Two new Tycol Cutting Oils are helping operators step up production by faster machining, better finish, and longer tool life.

For heavy duty cutting and grinding operations, they find Tycol #675's lubricating qualities prevent overheating and drawing of cutting edge temper; thus reducing the "down time" for tool regrinding and sharpening. Soluble, rust resistant, non-foaming, Tycol 675 possesses extreme pressure characteristics even when diluted 1:40, and permits surface cleaning without a degreasing agent.

Tycol #690 – a highly refined oil, specifically engineered for maximum results in machining aluminum and aluminum alloys – virtually eliminates the formation of "build-up" on the cutting tool edge. Coupled with the oil's high "wetting out" ability, this feature assures longer tool life . . . improved surface finishes . . . easier chip disposal. Further, its low Viscosity and extremely high Flash Point results in a minimum of carry-off and consumption – more production at less cost.

Call or write your nearest Tide Water Associated office for full data on these outstanding Tycol Cutting Oils – oils scientifically engineered for heavy duty and aluminum cutting jobs.

Makers of the Famous VEEDOL Motor Oil

FASTER MACHINING—The better cooling and lubricating job done by Tycol Heavy Duty and Aluminum Cutting Oils is effecting material savings in time and helps speed output even on the toughest metals.

BETTER FINISH—Neither Tycol #675 nor #690 will tarnish or discolor the work . . . and their ability to reduce formations on the cutting edge prevents break-offs gouging or scarring finished surfaces.

LONGER TOOL LIFE—Tools that work under these Tycol Cutting Oils have a long, useful life. Regrindings are materially cut, and the problem of chips welding to the tool is cut to a minimum.

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A THOROUGH JOB OF MASKING

QUICKLY DONE WITH
SCOTCH BRAND *Masking* TAPE

Protecting the bright metal parts of machine tools during spray painting is easily and quickly accomplished. "SCOTCH" Masking Tape moulds readily to any contour and the pressure sensitive adhesive is equally effective on metal, glass and plastic.

"SCOTCH" Masking Tape comes off as readily as it goes on . . . and comes off cleanly without leaving any of the pressure sensitive adhesive clinging to the surface of the metal.

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"SCOTCH" Masking Tapes are available in a variety of constructions to meet the varied needs of industry. As originators of unified pressure sensitive tapes we know countless shortcuts possible through the use of "SCOTCH" Masking Tapes. Use the coupon below and a "SCOTCH" Tape engineer will call and place our long experience at your service. There's no obligation.

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"SCOTCH" is the trade-mark for the adhesive tapes made by M. M. and M. CO.

"SCOTCH" Tapes are used for MASKING HOLDING • SEALING • SANDBLASTING REINFORCING • PROTECTING, ETC.

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Address _____

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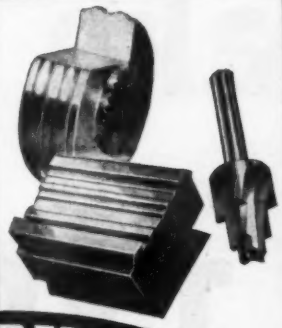
. . . PRECISION MADE FOR
EXACTING PERFORMANCE
AND
*Mastercased** TO GIVE UP TO
500% LONGER LIFE



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HIGH-SPEED
**Mastercased* CUTTING TOOLS*

Meet the Challenge

**Mastercasing . . .*
That's our improved super-heat-treating process which adds to the life of Masterform cutting tools . . . will multiply your production . . . will divide your costs per cut.

Want proof? Write, wire or phone for name of nearest-to-you factory representative . . . or without the slightest obligation, send specifications for estimates and complete information.

MASTERFORM TOOL CO.
IRVING PARK ROAD • CHICAGO 18, ILL.
OUTSTANDING ENGINEERING SERVICE AND CRAFTSMANSHIP

GRINDING WHEEL DRESSER

Desmond Cutter

Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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URBANA, OHIO
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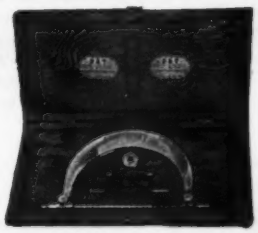
D&T MICROMETERS AND SNAP GAGES

Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . *Write for Bulletin 200* or outline your gaging problems.



• D & T Bow Micrometer 0 to 6 in. capacity

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

Average 100% to 300% Increase IN TOOL LIFE

Courtesy of Electrical Production Magazine

Deepfreeze Industrial Chilling Machine

Here is a manufacturer who has increased the life of standard high speed steel cutting tools on an average of from 100% to 300% through a simple sub-zero treatment in a Deepfreeze Industrial Chilling Machine. Shop records show gains up to 1000% per grind after tools have been subjected to cold treatment. The result of this increased tool efficiency is less machine down time and greater production economy.

Study the results that were obtained by this manufacturer and evaluate it to your own process. You, too, can secure equally good results by subjecting your tools to the same simple and inexpensive treatment in a Deepfreeze Industrial Chilling Machine.

Check the Results of Applying Cold Treating To Your Production by Contacting Deepfreeze Engineering Service

Cold treating is not confined to the treatment of metal cutting tools. It is used with the same efficiency for many component parts where long life and very close tolerances are required. The greater dimensional stability, possible by reason of the sub-zero treatment, will also prove highly profitable in critical components, gauges, and all types of precision instruments. It is being widely used to contract metal for shrink-fit assembly and for testing and numerous other purposes. All can be accomplished right in your own plant. Why not find out? You can predetermine the many results of applying cold treating to your production by contacting Deepfreeze Engineering Service. This service will not obligate you in any way.

OHIO CRANKSHAFT INCORPORATED
3800 HARVARD AVENUE
CLEVELAND 5, OHIO

Mr Rhodes Hanna
Industrial Equipment Division
Deepfreeze Corporation
703 Hanna Building
Cleveland, Ohio
Dear Mr Hanna

We are pleased to forward to you the results obtained by deep freezing high speed steel tools through one of your units. The results so far are very encouraging and we want to thank you for your cooperation

Tool	Operation	Type of Steel Worked	(Avg Pcs (Std	Per Grind) - Deepfreeze)	% of Increase
T-65808	Milling	SAE X-1335	371	968	160%
CT-2007 (3/16-11")	Drilling	SAE 1050	5	14	180%
CT-4696	Chamfering	SAE 1045	1.0	1 5	50%
2T-70261 (1-1/8")	Rough Tap	AMS 6415	30	490	300%
2T-70262	Finish Tap	AMS 6415	20	86	330%
CT-109	Finish Form Ream	AMS 6415	7	17	142%
CT-2	Bore	AMS 6415	6	18	200%
2T-69919 (1-1/2")	Rough Tap	AMS 6415	25	93	272%
2T-70261 (1-1/8")	Rough Tap	AMS 6415	30	348	1000%
CT-4533	Cheek & Fillet	Carbon Steel	12	13	10%
T-41692	Hob Spline on Front & Rears—	AMS 6415	7	16	120%
2T-12859	Hob 16-pitch thd Front & Rear—	AMS 6415	70	200	185%
CT-4416	Cheek & Fillet Pins—	SAE 1050	5	9	80%
2T-20758	C't'b'r, C't'r'ts Aircraft—	SAE X-1335	30	41	37%
CT-412	Cut Woodruff Key (1" Tap) Tap Detroit	SAE 1050	70	162	131%
CT-1007	Diesel Shaft—	CM-X-1050	50	143	186%
CT-308	Mob 12-pitch thd in Univ Line. Cummins—	2T-C-1050-1	30	124	313%

Very truly yours,
OHIO CRANKSHAFT, INC.

C. H. Scheihing
Chief Process Engineer

CHS-rdk

FREE COLD TREATING FACTS TO IMPROVE PRODUCTION...

You can use the information in this new Deepfreeze Booklet to improve many phases of your production. It relates a complete history of cold treating... details several of the most reliable cold treating procedures... cites actual performance stories that you can duplicate ...and lists much additional data of extreme value. Write today for your free copy.

1. Molybdenum Type Steel Tools
   - *A. Use standard heat treatment and drawing procedure.
   - B. Cool to room temperature.
   - C. Cold treat at −120° F. to −130° F. for two hours and allow to return to room temperature.
2. Tungsten Type Steel Tools 18-4-4 and 18-4-2
   - *A. Use standard heat treatment and drawing procedure.
   - B. Cool to room temperature.
   - C. Cold treat at −120° F. to −130° F. for two hours and allow to return to room temperature.

RESULTS:
1. Tool failure after cold treating almost disappeared.
2. Magnaflux inspection showed very few cracks, seams, or other irregularities.
3. Rockwell "C" hardness 63-65.
4. Tool life greatly increased up to 1500%.

Detailed heat treating and drawing procedures used on these tools available upon request.

Ship Us Your *Old* THREAD RING GAGES! We Will Make Them *New!*

SAVE time in getting Thread Ring Gages for rush work! Ship us your worn gages and let us give them a new lease of life! We re-lap the worn threads on pitch diameter, re-lap the major diameter to sharp V, eliminate bell-mouth, enlarge the slots and replace worn bushings, adjusting screws and locking nuts when necessary.

Unless the gages are so badly worn that they are hopeless, we make them as good as new—at a saving of 30% as compared with the cost of new gages.

NOTE:
When sending special pitch-diameter gages, be sure to send also the setting plugs.

Write for Literature

30% Saving!

Standard Thread Plug and Ring Gages Now Available from Stock

The **STANDARD** *Thread-Gage* **COMPANY**

15922 FENKELL DETROIT 27, MICH.

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STANDARD SIZES AVAILABLE FROM STOCK

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Manufactured to precision tolerances from fine grade of tool steel carefully heat treated.

Write for catalog No. 243

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Actual Size Photo
3 Carat Size—Common
1/8" Shank—$36.00 ea.

DIAMONDS *for Production*

RE-SET-ABLE • BIG-HED-NIB
(Trade Marks Registered)

Equip Now with "RE-SET-ABLE" Diamond Tools on Your Precision Grinding Production Line

LOC-KEY-SET
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U. S. Pat. 2,351,741

16
Factory Branches
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Everywhere

● **RE-SET-ABLE** adds to life of your diamond . . . More work per carat. Exclusive patented setting is tender to the diamond . . . Holds firmly . . . Protects from damage . . . Guards against breakage.

No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of 1/8 carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

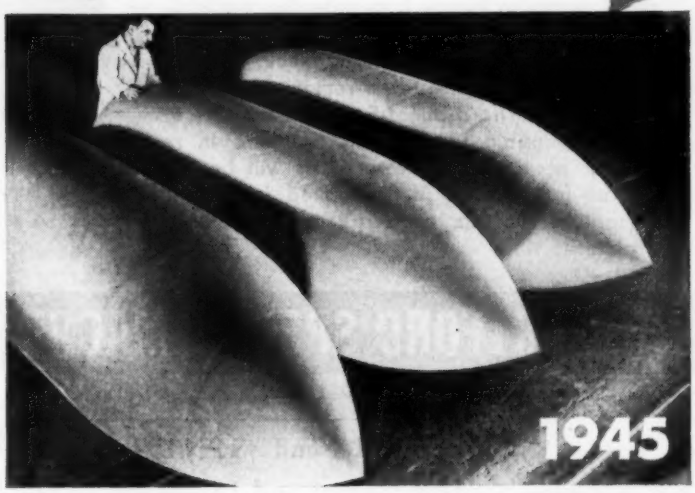
DIAMOND TOOL COMPANY, Not Inc. SHELDON M. BOOTH, Pres 935 E. 41st Street CHICAGO 15, Ill

BETWEEN TWO WARS...

27 YEARS OF UNENDING WELDING RESEARCH

One of the most challenging new weapons of World War I was this early form of aerial bomb—mass produced by A. O. Smith with SMITHway welding techniques which, even then, were revolutionary.

Continuous welding research in A. O. Smith laboratories and plants made possible the production for World War II of 22,000-lb. "Volcano" bombs—by an arc welding process that combines SMITHway Electrodes and SMITHway mastery of welding techniques.



The Proof Is in Production

Now . . . a Complete Line — SMITHway A. C. WELDERS

Ready for delivery soon, the new, complete line includes three new models of 150-, 200-, and 250-ampere capacity, in addition to the heavy-duty models of 300-, 400-, and 500-ampere capacity. Write for full specifications and prices.

A. O. Smith plants have produced more than 7 million tons of welded steel products. On parts and products of every size and degree of complexity, more than 320,000 SMITHway Electrodes are used in these plants every day. Millions more are used by other manufacturers.

Side by side with the production that repeatedly proves the quality and uniformity of SMITHway Electrodes, unending welding research goes on . . . as it has since 1917.

For detailed specifications on SMITHway Electrodes and their application to specific welding jobs, send for the SMITHway Welding Catalog.

Mild Steel . . . High Tensile . . . Stainless Steel

SMITHway WELDING ELECTRODES

made by welders . . . for welders

SMITHway *Certified* WELDING ELECTRODES

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NEW YORK 17 • PITTSBURGH 19 • CHICAGO 4 • TULSA 3
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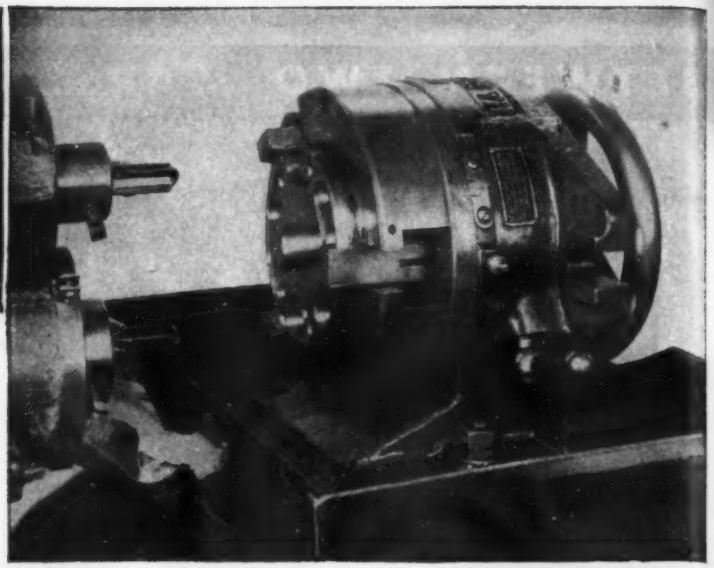
INTERNATIONAL DIVISION: MILWAUKEE 1, WIS. • In Canada: JOHN INGLIS CO., LIMITED

THE HARTFORD SUPER-SPACER
Lends Itself To Many Indexing Operations . . . For Example: FINISH MILLING



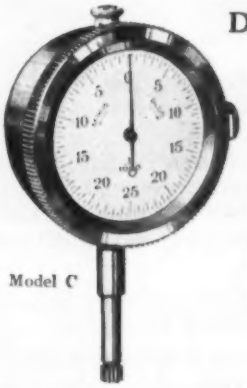
WITH the available attachments and special fixtures already developed, the Hartford Super-Spacer provides quick, easy setup for a remarkable number and variety of indexing operations. Milling is no exception.

Aircraft engine tolerances in an indexing operation, as shown here, are easily maintained in this set-up for finish milling. A hand-wheel-operated quick clamping fixture is mounted on the base of a standard Super-Spacer. Work is securely held and slots are finish milled in the piece. Indexing is extremely rapid and positive, mask plates in the Super-Spacer removing all possibility of error. This example of the use of the Hartford Super-Spacer is but one of many possibilities open to production men responsible for meeting problems in reconversion to peacetime work when greater accuracy and lower costs will be the order of the day. What the Super-Spacer has already accomplished is an indication of its outstanding utility and versatility. Our engineers are available to help you solve your current and future problems.

Outline your needs . . . ask for further information.

THE HARTFORD SPECIAL MACHINERY CO. *Hartford 5, Conn.*

RANDALL and STICKNEY
Dial Gauges and Indicators



Model C

are accurate, reliable and built to stand the gaff of hard usage.

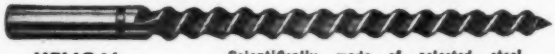
This Model C Dial Indicator has a 2⅛ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO.
Waltham 54, Mass., U. S. A.
Makers of Dial Gauges Since 1885

HOLMAN
BETTER, FASTER HOLE FINISHING



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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LUERS
Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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. . . when you must use a soluble oil — and the job is tough

Solvol has extra lubricating qualities which enable it to perform metal cutting jobs beyond the scope of other soluble products. This unique product, plus the skill of Stuart Oil Engineers, can solve machining problems for you. D. A. Stuart Oil Co. Ltd., 2729 So. Troy Street, Chicago 23, Illinois.

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ESTABLISHED 1865

FOR ALL CUTTING FLUID PROBLEMS
Stocks in Principal Metal Working Centers

The Leader in it's field

MODERN SELF-OPENING STUD SETTERS

Used by practically every automobile, truck, tractor, diesel engine manufacturer and others with studs to set in quantity.

As the action of the tool is positive and automatic, it can be operated in any position with either air or electrically operated portable tools. It can also be used in a drill press, where it is possible to drill and tap the holes and set the studs in successive operations.

The three simple MODERN steps to speed, economy, and convenience in stud setting are illustrated at the right.

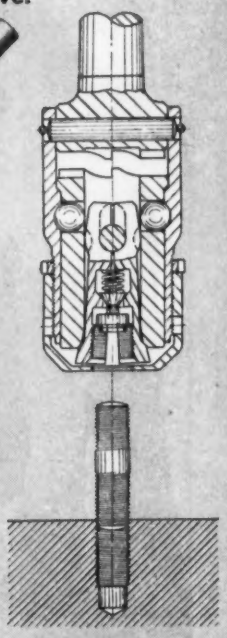
At the top . . . jaws open to take the stud.

Middle . . . driving position, jaws locked on stud.

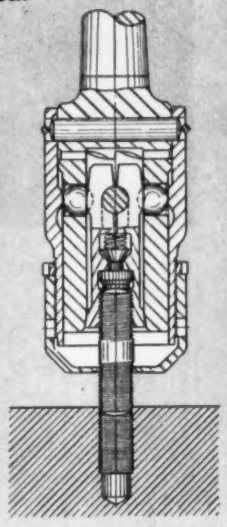
At the bottom . . . stud driven to full depth. The stop collar contacts the work and releases the clutch. Lifting the tool opens the jaws.

The tool revolves in one direction, no reversal, for the complete job.

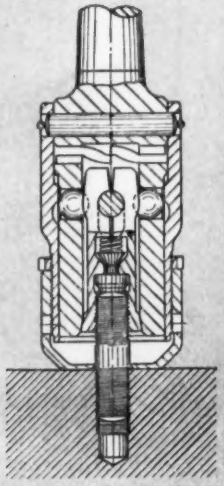
Tool brought to position over stud, about to begin drive.



Start of the drive, with tool engaged on the stud.



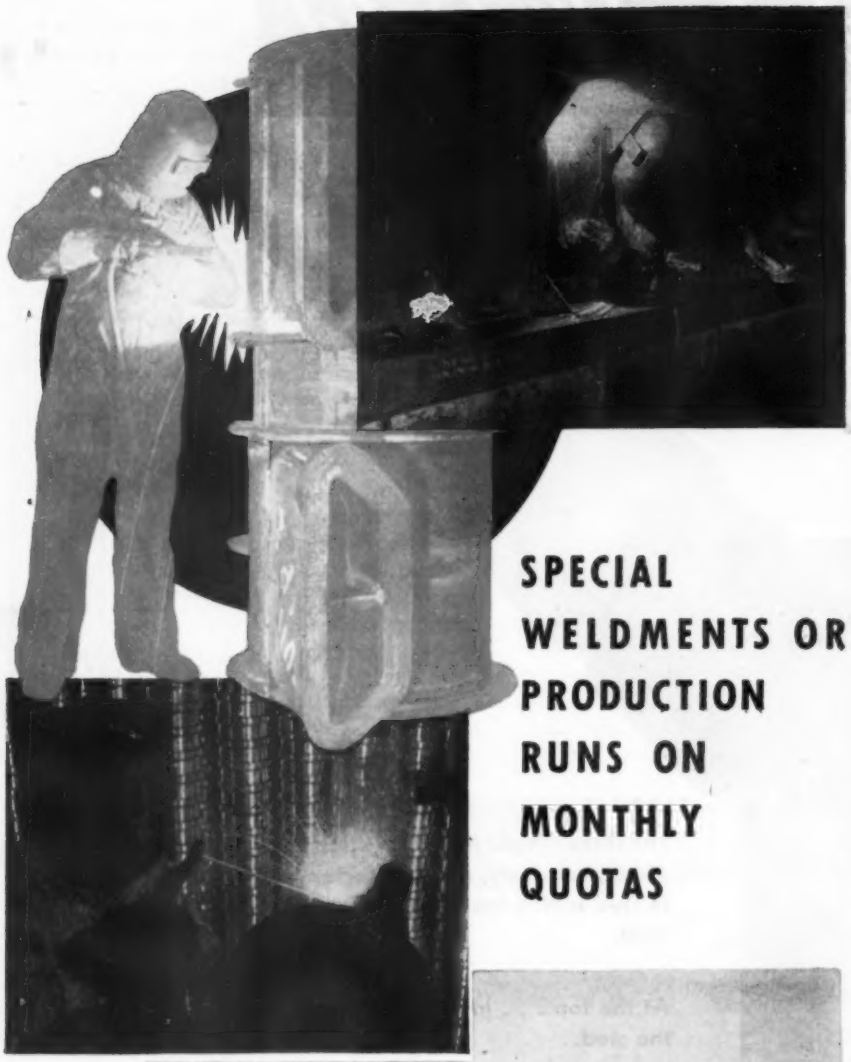
Drive completed, with clutch released.



Write for detailed information on the Modern Stud Setter. You will be interested in how and why it provides a proved means for stepping up your production.

MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK



SPECIAL WELDMENTS OR PRODUCTION RUNS ON MONTHLY QUOTAS

You may or you may not be interested in diesel frames, crane bed plates, machine tool bases, frames and levers—in manifolds, impellers, field rings.

But you definitely are interested in your own product and in ways to improve it—in welding all or certain parts of it, if by so doing you actually can better it.

Weldments almost always lighten a part and at the same time strengthen it. Weldments make for better contours and often accomplish production economies.

Study your design. If by redesigning it in part you can render it suitable for welding, that is the thing to do. Our engineers will co-operate.

Forward your prints for study and recommendation, or write.

ARMY-NAVY E

WELDING ENGINEERS · UWCO · MIDDLETOWN, OHIO

THE UNITED WELDING CO.
MIDDLETOWN, OHIO

WELDING FABRICATORS OF MODERN DESIGNS

"I WOULDN'T BE WITHOUT ONE"

THAT'S what machinists, engineers, draftsmen, carpenters and scores of others are saying about this unique pocket rule . . . and no wonder, the Streamline is actually *five* rules in one!

With its unique tape lock and extra foot, the Streamline, in addition to regular measurements, can be used for inside measuring, calipering, "blind" measuring; and as a height gauge and scriber.

Its case is sturdily constructed of high-grade chrome plated steel with tape of imported Swedish spring steel. There is nothing internal that will bend, loosen or jam. Blades are easily interchanged.

Why not order your rule today . . . priorities are no longer necessary,

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WOOD AND TAPE RULES
TRADE MARK

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Please send me:
- ☐ STREAMLINE 6 ft. size ($2.00 ea.)
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- ☐ 8 ft. replaceable blade (70c ea.)
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OIL AND AIR HARDENING DIE STEEL CHARACTERISTICS

TOOL STEEL DATA

Revised data for Oil and Air Hardening Die Steels including types, analyses, uses, hardening characteristics and temperature ranges

OCTOBER, 1945

OIL AND AIR HARDENING DIE STEEL CHARACTERISTICS

TYPE	GRADE	ANALYSIS	USES For Cold Work Dies, and Tools Requiring:	HARDENING CHARACTERISTICS	
				HARDENING TEMPERATURES	QUENCH RC
High Carbon High Chrome	SUPERDIE	C 2.10 Si .90 Cr 10.50 W .80	• Close Tolerances • Greatest Production • Best Wearing Ability	Range: 1700° F. to 1750° F. Small or Intricate Sections 1700° F. Large Sections 1750° F.	Oil.....64-66 Air.....58-62
High Carbon High Chrome	ATMODIE	C 1.50 Cr 12.00 Mo .80 V .90	• Minimum Warpage • Long Life	Range: 1800° F. to 1850° F. Small or Intricate Sections 1800° F. Large Sections 1850° F.	Air.....62-64
Non-Deforming Deep Hardening	OILDIE	C .90 Mn .60 Cr 1.50 W .50	• Accurate Dimensions • Good Cutting Qualities	Range: 1500° F. to 1550° F.	Oil.....62-64
Non-Deforming Standard Type	EXL-DIE	C .90 Mn 1.15 Cr .50 W .50 V .10	• Little Dimensional Change • Ease in Hardening	Range: 1480° F. to 1525° F.	Oil.....62-64
MARTEMPERING:	The oil hardening die steels can be quenched in hot salts maintained at 400° F. After which they can be cooled in air to room temperature. This will reduce stresses ordinarily set up in this temperature range.				
TEMPERING:	For maximum hardness temper from 350° F. to 400° F. The High Carbon, High Chrome steels can be tempered up to 900° F. where increased toughness is desired, and double tempering is recommended.				
GRINDING:	For grinding use a clean free cutting wheel. For final tool sharpening, a cutter grinder with fine grit such as No. 320, with removal up to .001" will give a fine finish and substantially lengthen the life of the tool.				

COLUMBIA TOOL STEEL COMPANY

MAIN OFFICE AND WORKS — CHICAGO HEIGHTS, ILLINOIS

Branches and Warehouses: CHICAGO • CINCINNATI • CLEVELAND • DETROIT MILWAUKEE

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Your Lathe Equipment is Vital to Your MAXIMUM Capacity for Peacetime Production!

LYNN

Precision TURRET UNITS

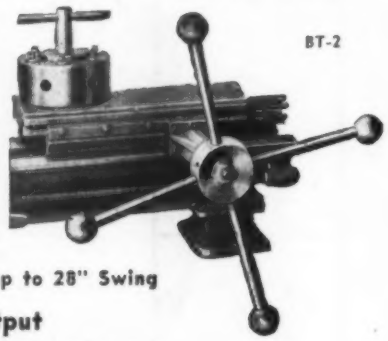
Will recondition worn or inaccurate Turret Lathes and Screw Machines or Convert engine Lathes. For Speedy and accurate Turret Work.

OVERNIGHT . . . AT LOW COST

Heavy Duty Self-Indexing

BED TURRETS

BT-2



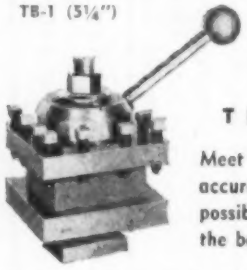
For any Make or Size of Lathe from 13" Swing up to 28" Swing

- **Multiply output**
- **Increase variety of work**
- **Permit use of less experienced help**
- **Help you lick post-war competition**

Tested and proven in exacting war production throughout the nation and in other parts of the world . . . we have specialized for years in designing tools for fast production.

CUT DOWN SET-UP TIME AND INCREASE PRODUCTION CAPACITY

TB-1 (5¼")



LYNN Double Locking TOOL POST TURRETS

T Bolt or Bolt Circle Mounting

Meet the present day demand for an accurate post that will take the heaviest possible cuts without the turret raising off the base of the post.

Meet peacetime production requirements with fast accurate tools. A turret lathe or engine lathe is no better than the tool post with which it is equipped.

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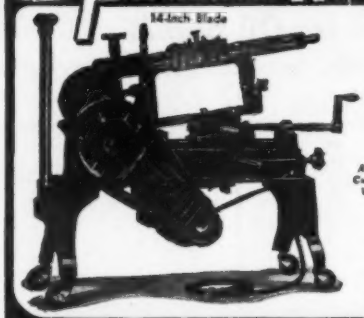
POWER HACK SAW

14-inch Blade



Angle Cutting Vise

LOW PRICED SELF-CONTAINED

PORTABLE STURDY

READY TO WORK ECONOMICAL

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NEW YORK 4, N.Y.

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HARDNESS TESTER

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That's one of the reasons why they're as well known for cutting costs as for promoting precision. Hardened tool steel. Two types, all sizes. Sold singly or in sets. Prompt delivery. Bulletin 1043.

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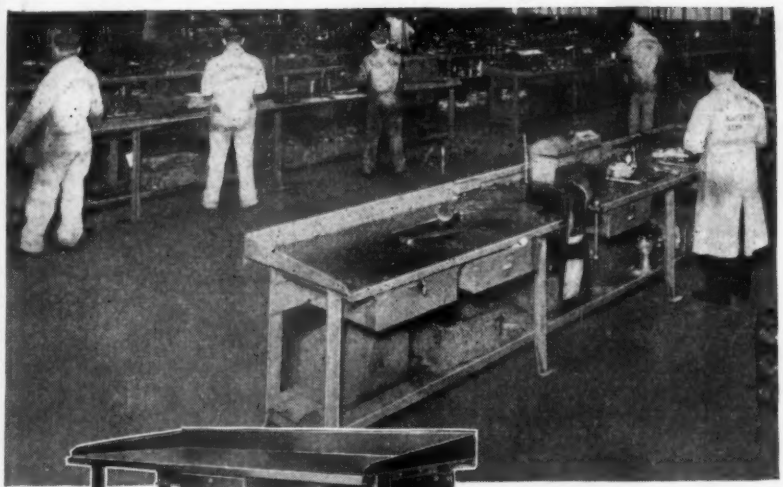
The Name to Remember for Your Shop Equipment



HALLOWELL DE LUXE SHOP FURNITURE OF STEEL

Below: Modern furniture for modern shops! Neat appearance combined with exceptional utility and sturdy construction lift this "Hallowell" DeLuxe furniture far above the ordinary. Interchangeable shelf, cabinet and drawer units provide a variety of combinations.

Fig. 732
Pat'd and
Pats. Pend.
Drawer is extra.

HALLOWELL SHOP FURNITURE OF STEEL

Above: Over 1300 ready-made and interchangeable styles in this indispensable work-bench. That means you have a wide range from which to choose — you're certain of satisfaction, without the trouble and expense of special designing and construction. These benches are built to "take it," too — they stand firmly *without* costly bolting to the floor.

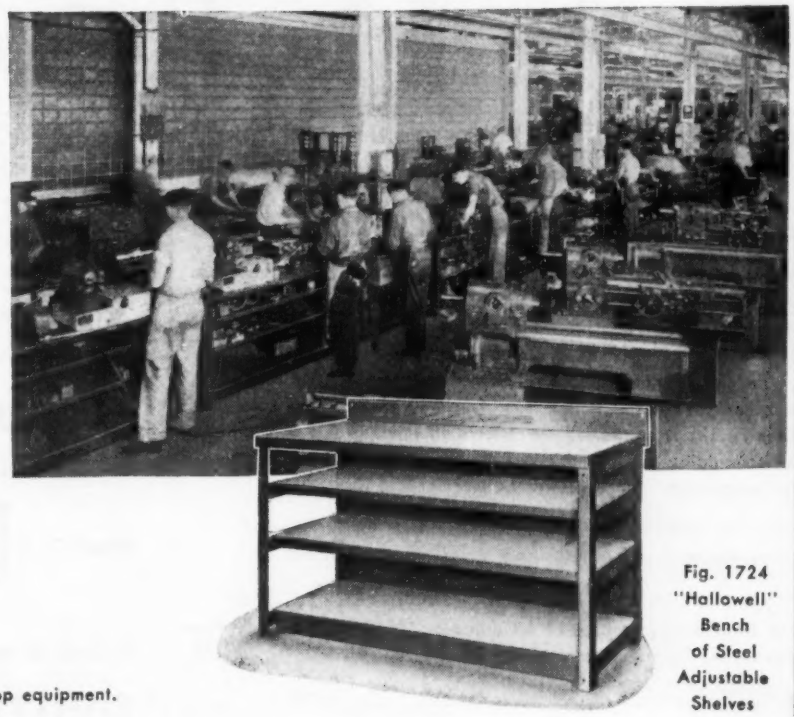


Fig. 1724
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Bench
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Adjustable
Shelves

Send for bulletin today for further suggestions on shop equipment.

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SPECIFY
Filtaire

No. 2 PORTABLE DUST COLLECTORS

Dust which circulates through industrial plants can cause thousands of dollars worth of damage—damage to machines, workers' health, floors, ceilings, finished products. Yet, you can help prevent such damage easily and economically by using Filtaire Portable Dust Collectors. Just plug in a Filtaire on any handy 110-volt circuit. Face the suction end toward the trouble spot (such as grinders and polishers), and the Filtaire is on the job. It collects all floating dust *immediately*, then recirculates the clean air. The Filtaire can be supplied with either inexpensive replaceable filters, or cleanable filters.

To "Keep it Clean", specify Filtaires—they soon pay for themselves by reducing the wear and tear on your other plant equipment.

Please send me a free copy of Bulletin No. 444 which gives complete details on the Filtaire Portable Dust Collector. A.M.

NAME_____ TITLE_____

COMPANY_____

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BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

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PREPARING DIE CASTINGS BEFORE APPLYING COLOR

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Realizing the vital role precise surface preparation plays in guarding against paint adhesion failure, Oakite has prepared a 12-page Digest, "Production Cleaning of Die Castings." In its pages you will find the kind of information you're looking for to help keep unit costs low . . . help keep production going at a smooth, efficient pace. Send for your FREE copy TODAY!

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Famous for

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- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 238 Jan. 18, '45, American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Bergenger, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

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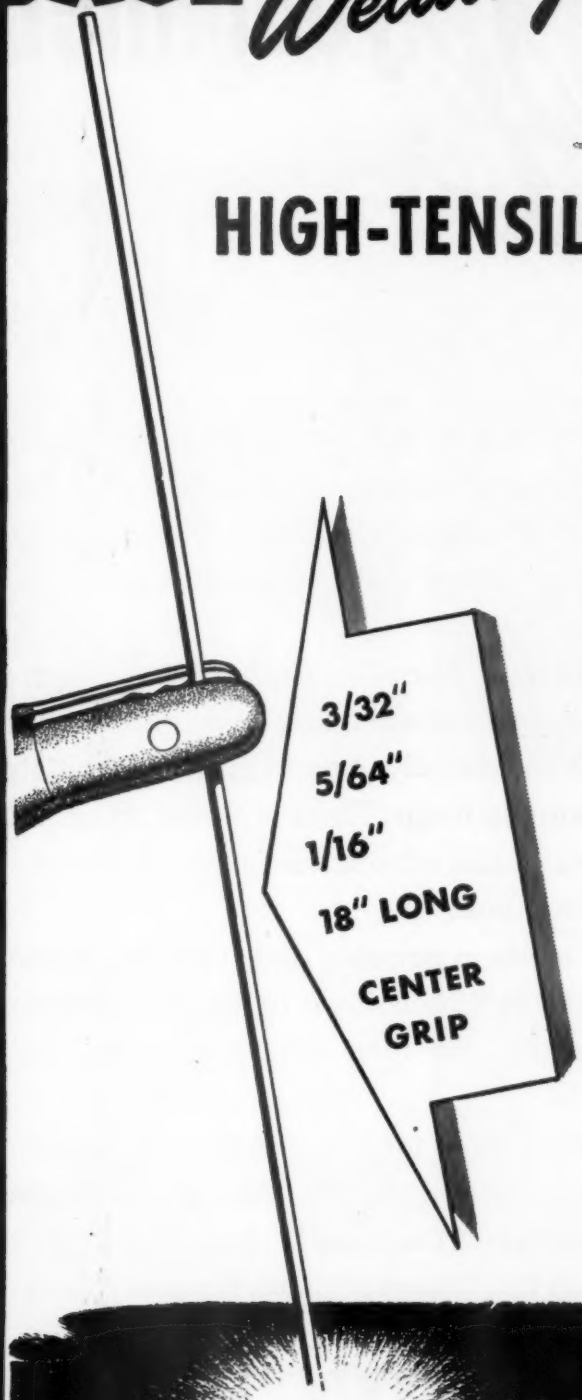
Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS
UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

PAGE *Welding* ELECTRODES

HIGH-TENSILE "AF" NOW MADE IN "MIDGET" SIZES



• Light gauges of mild steel, which formerly had to be joined by means of some other method, can now be successfully welded. These new PAGE Hi-Tensile "AF" Electrodes, in midget sizes—3/32″, 5/64″, 1/16″—solve the problem.

These general-purpose electrodes, heretofore made only in sizes down to ⅛″, are of the shielded-arc type—suitable for welding in all positions. They conform to A. W. S. Specifications E 6013, E 7011 and E 7012. These new smaller sizes open up many new possibilities for electric welding.

Your PAGE distributor will give you further information about these and other PAGE electrodes and gas welding rods.

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ACCO TRADE MARK

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Modernize your metal c

Here's the fast, modern method of cutting steel to any shape, practically any size, and in most any quantity. These speedy, metal-cutting tools bring new economy and flexibility to all steel-cutting operations . . . from squaring and shaping of large plates and heavy slabs to quantity-cutting of small steel parts.

Made in a wide range of types and sizes, Airco Gas Cutting Machines are designed to meet the needs of industry from the smallest metal shops to the largest steel fabrication plants. Each Airco machine performs a wide variety of cutting jobs within its specific operating range. There is almost no limit to the thickness of steel which may be cut, and all standard plate thicknesses are well within the range of Airco machines.

Airco Gas Cutting Machines are made in portable and stationary types, designed for single and multiple torch operation. Their rugged construction and excellent operating characteristics give them long, trouble-free life, even under heavy service loads.

Call or write your local Airco office today for free copies of descriptive booklets on Airco Gas Cutting Machines or, if you prefer, address your request Dept. AM, **Air Reduction, General Offices: 60 East 42nd St., New York 17, N. Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.**

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Gas

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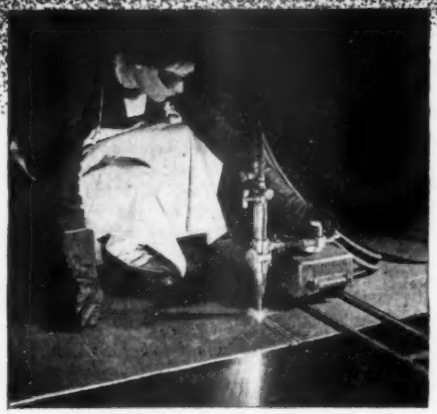
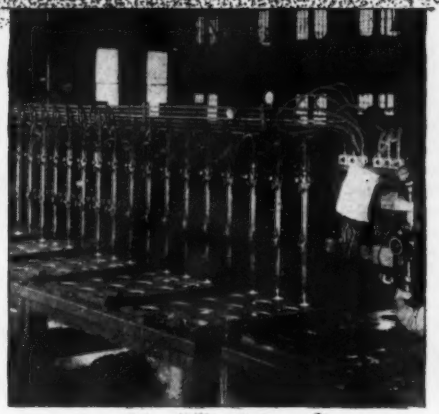
AIRCO GAS CUTTING MACHINES

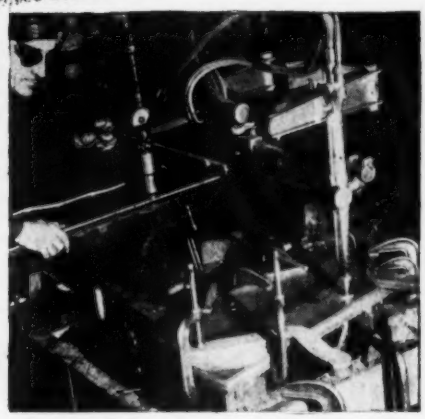
...A TYPE AND SIZE FOR EVERY CUTTING NEED



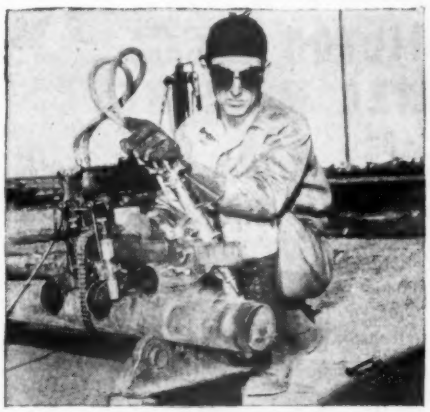
Squaring, beveling and many similar cutting jobs are performed swiftly and accurately by the Airco No. 10 Radiagraph. Lightweight and portable, this little motor-driven machine also cuts arcs and circles up to 85" in diameter.



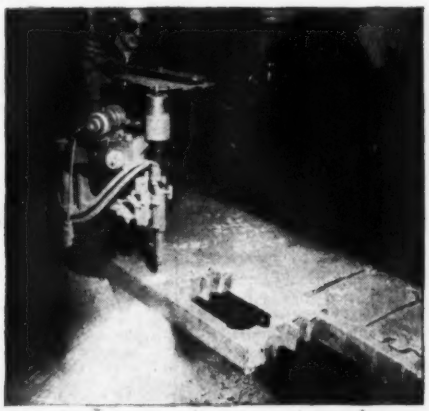
Large-area cutting and quantity production of small parts is speeded by the Airco No. 41 Travograph, a motor-driven machine which moves on a track located alongside the work. Multiple cutting torches are guided by a tracing device which follows a cam or template of the required shape.



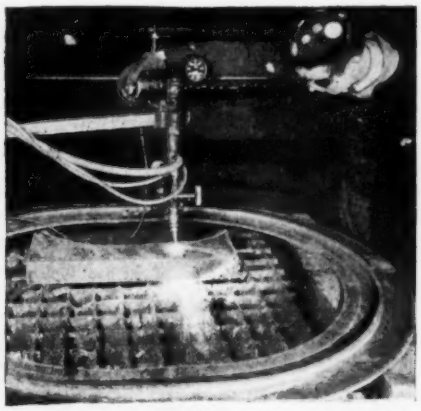
Stack cutting small parts with the Airco Planograph. Identical parts of any design are accurately shaped in one operation by "stacking" the plates to any thickness within range of the cutting torch.



Pipe cutting and beveling simultaneously with the portable Airco No. 1 Pipe Cutting and Beveling Machine. This handy machine requires no power. It is operated by a crank which revolves the machine around the pipe. If desired, the machine may be held stationary while the pipe is revolved.



For fast cutting of small shapes the Airco No. 5 Camograph is ideal. It cuts parts of any contour by means of a motor-driven template roller which follows a metal template of the required shape. This in turn controls movement of the torch, and assures speedy, accurate cutting.



Continuous, curved bevel cuts and special symmetrical shapes are made with the Airco No. 10 Polygraph, a motor-driven machine that travels on a track which is also the template for the cut. The Polygraph is one of many Airco machines designed for special cutting operations.

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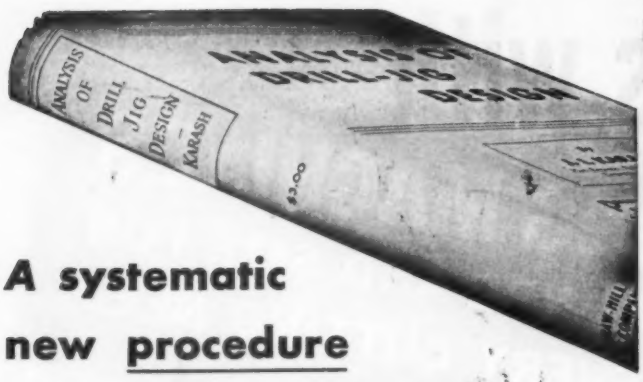

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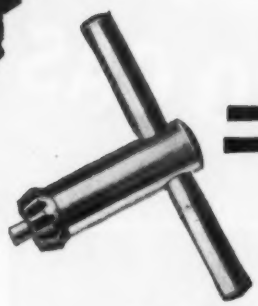

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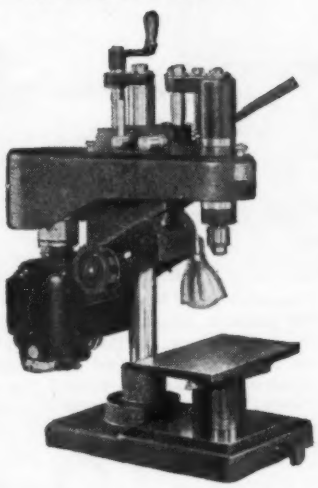

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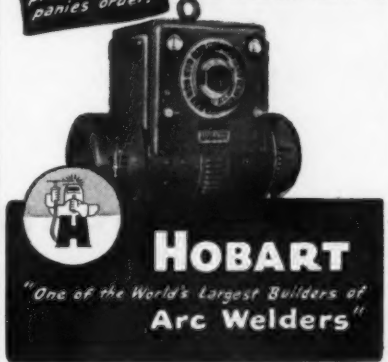

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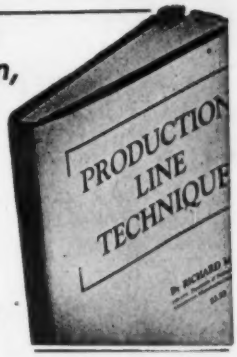

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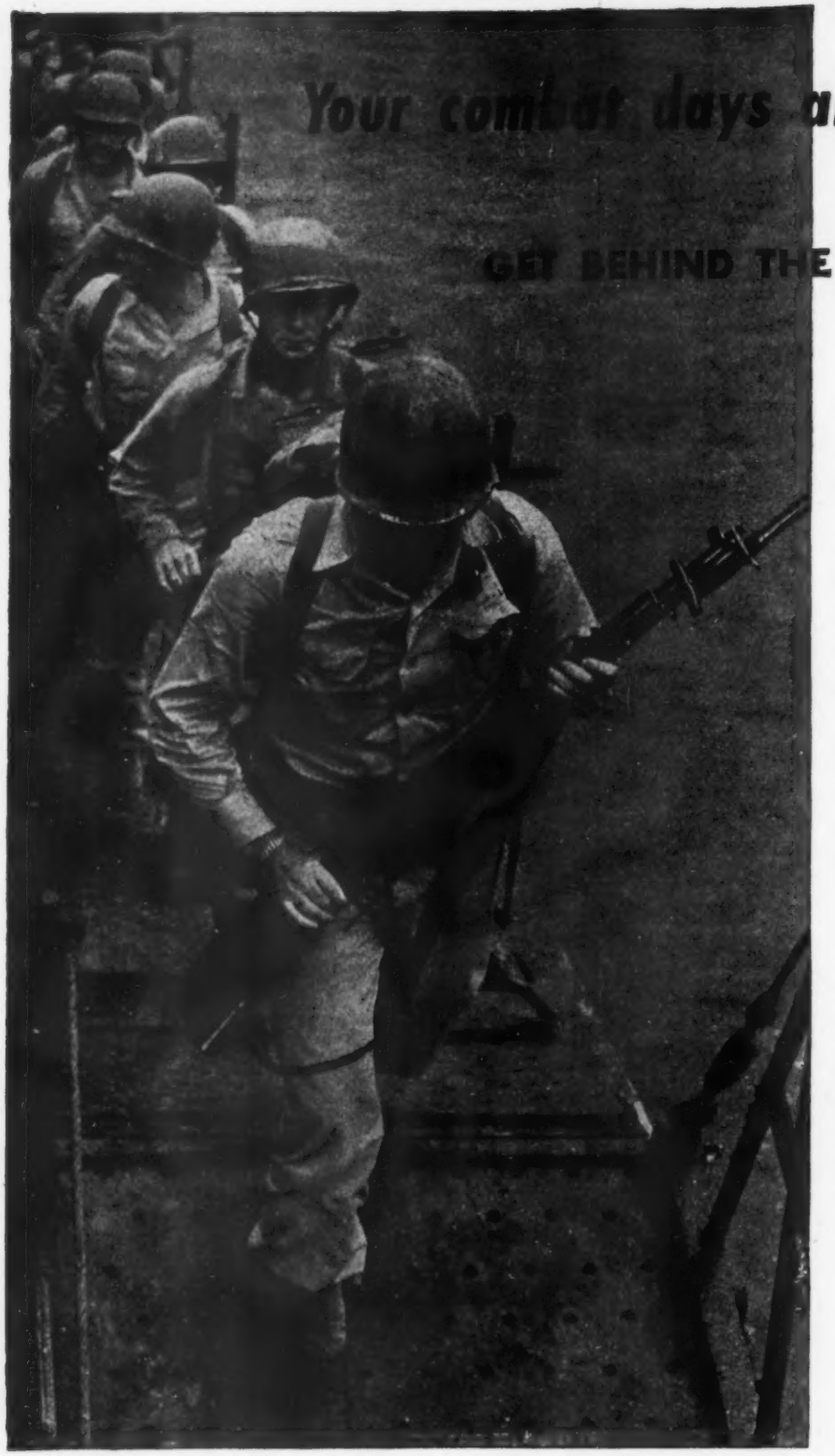

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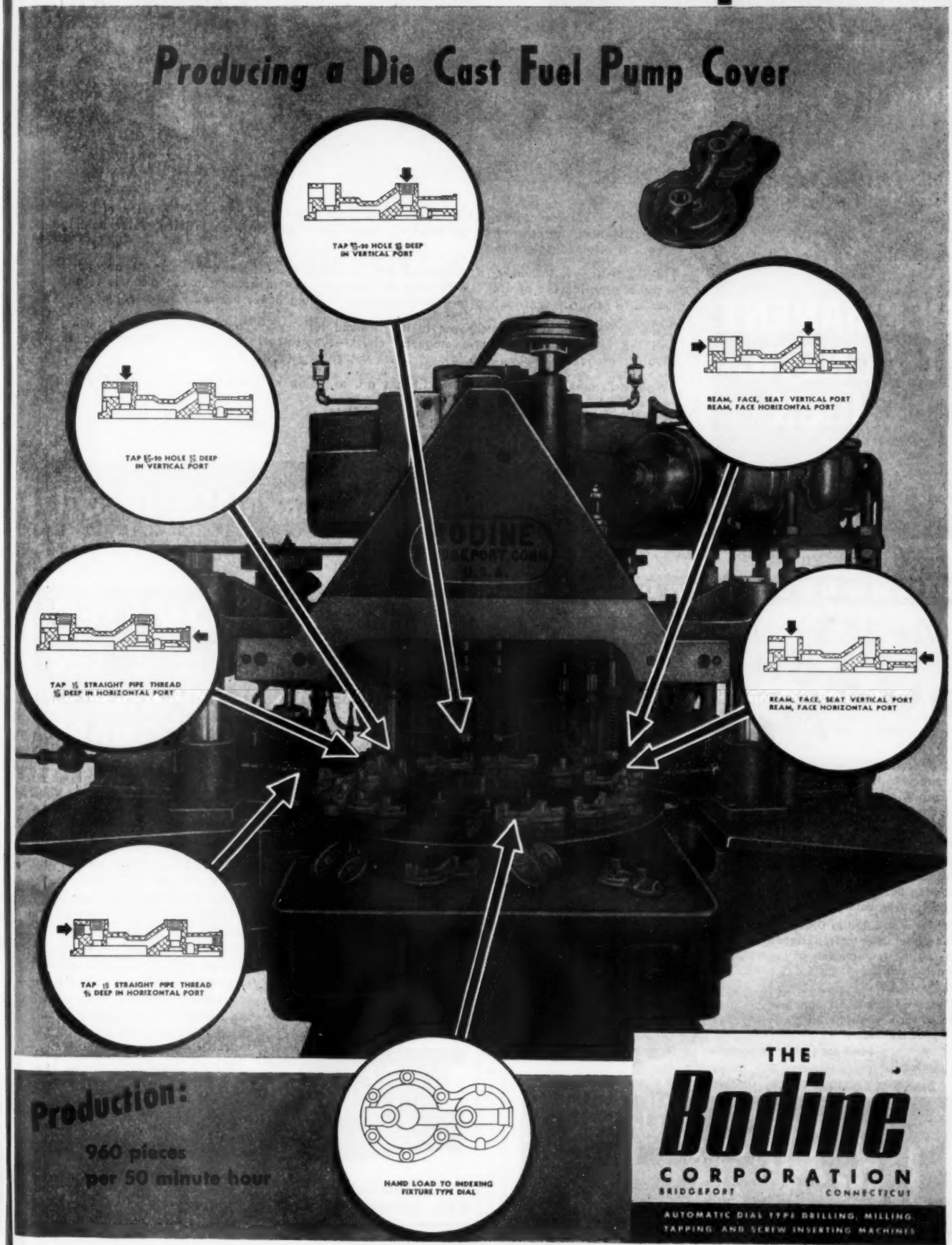
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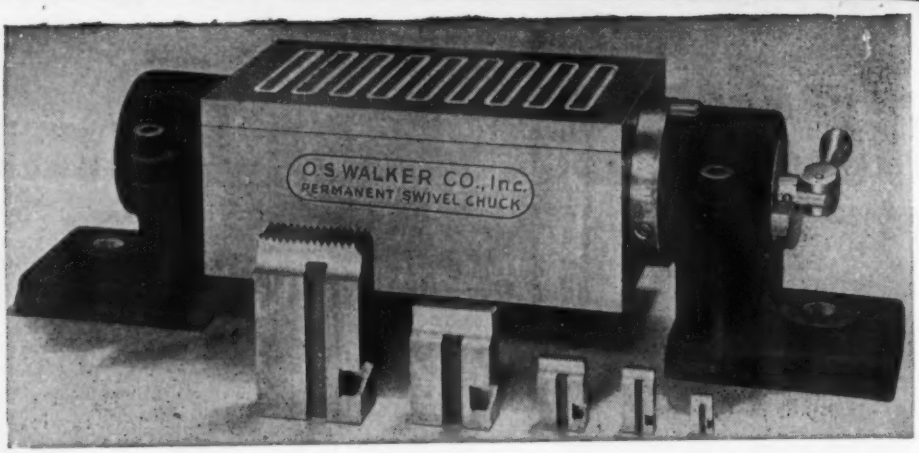

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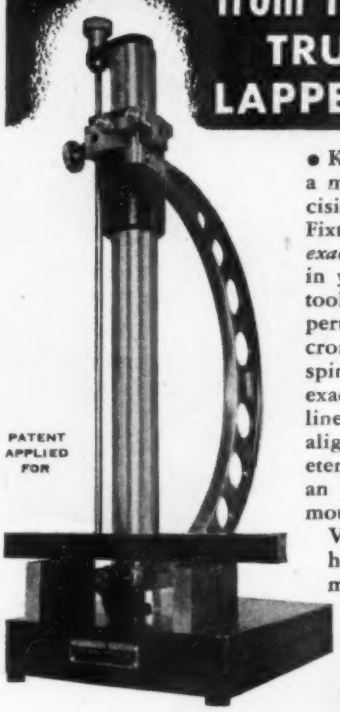

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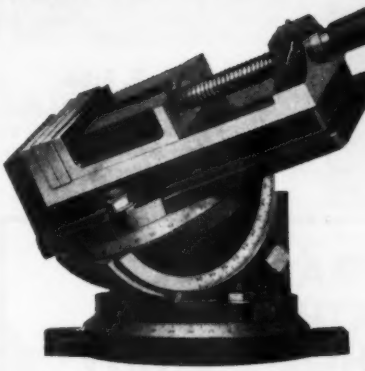

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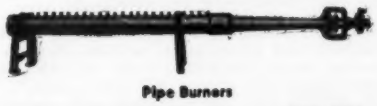

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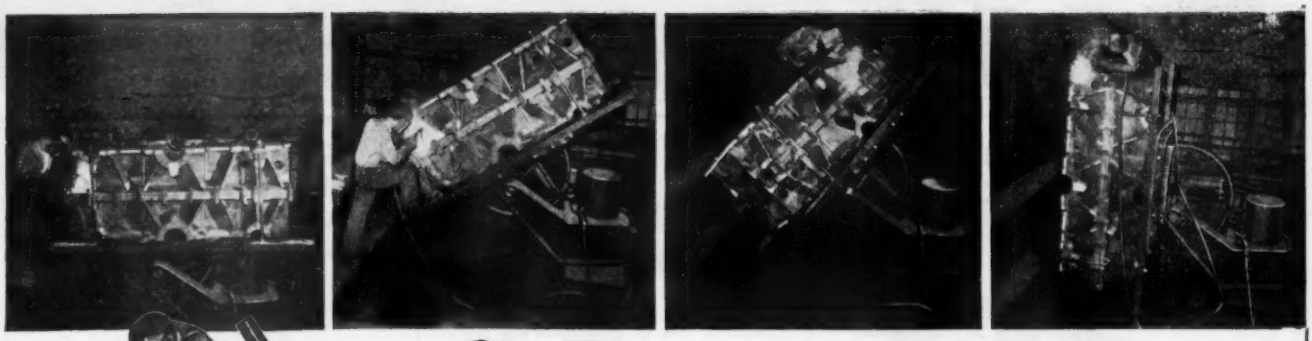
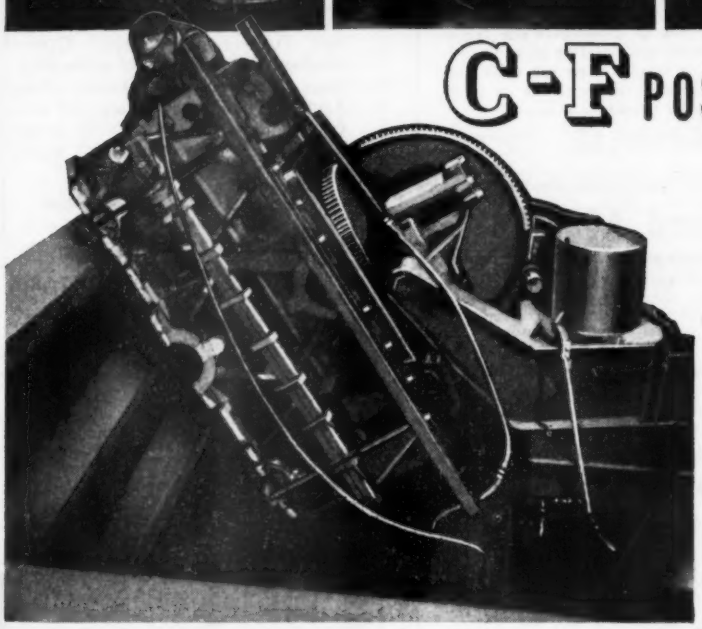




C-F POSITIONERS cut welding time and cost on heavy gear cases

This special installation of a 14,000 lbs. capacity C-F Positioner allows all the welding on two large units in a downhand position and with a single set-up! Two units are mounted together with the positioner extended over a pit. The long weldments can then swing from horizontal to 135°, and can be rotated 360° with variable speeds from 0 r.p.m. up. The need for a "strongback" is eliminated and ample floor space and headroom under cranes assured.
C-F Positioners and installation technique can cut *your* welding time and cost. Capacities from small hand operated positioners to large units handling 30,000 lbs., are available.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1313 S. Kilbourn Avenue Chicago 23, Ill.

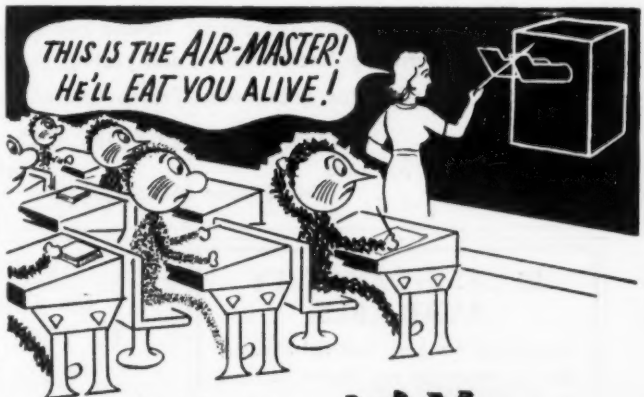
Photos courtesy of Farrel-Birmingham Co., Inc. Ansonia, Conn.

"These drivers on the H.P. Rotor absolutely did away with all vibrations and smoothed out all cuts. We then changed to the Cruiser Rotor and used a 1" square nose tool without any trouble, something we cannot do with the solid drive. I believe a lot of tool breakage will be avoided." . . . memo from one of America's largest manufacturers, name on request.

Drafto Vibra-Drive interposes an absorbent cushion, takes up tool and gear train vibrations. Five sizes for swings up to 72". For all work held between centers on lathe or grinders. Write, wire or phone for full information.

GREENLEAF CORPORATION

Dept. AM. Wilkinsburg, Pittsburgh 21, Pa.



The Air-Master thrives on dust and grit, but your employees don't. Neither do sensitive parts of valuable machinery. Protect them from these tiny but harmful agents of destruction. Have the Air-Master installed at your buffers and grinders. It sucks up every tiny bit of dust and grit the moment they fly from the whirling wheels. Prevents them from getting into the air your employees breathe. Keeps them out of delicate mechanisms.

The Air-Master is fully self-contained—efficient, rugged, dependable. A size for every grinder and buffer. Write today for full details.

NOW AVAILABLE — Two, Three and Five H.P. grinders and buffers.

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LEBLOND MACHINE TOOL CO. CINCINNATI, OHIO

2615-21 Madison Rd.

CONTRACT WORK

MACHINES AND PARTS, SPECIAL TOOLS, ETC.

to your specifications

SPECIAL ENGINEERING WORK

. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling

THE A. H. NILSON MACHINE CO. Bridgeport, Conn.

STAMPINGS and ASSEMBLIES

We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

"Greater Savings with Greist"

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

SPECIALTIES — PRECISION WORK

Available capacity for automatic screw machine products up to 1⅝" diameter.

Equipped for secondary operations: Thread rolling and chasing, centerless grinding, drilling, heat treating, and plating.

Forward blueprints for quotations. Prompt-efficient service.

JOHN L. BUXTON CO.

26th & Reed Streets **Philadelphia 46, Pa.**

Tel.: FULton 0628 and 0629

EXCESS CAPACITY AVAILABLE:

Guaranteed Machine Tool Rebuilding—Special Machinery and Parts—Contract Work.

Estimates cheerfully furnished

BARRETT MACHINE TOOL COMPANY

Meadville, Pa.

(Since 1881)

WANTED — WORK

ON CONTRACT BASIS TO YOUR SPECIFICATIONS

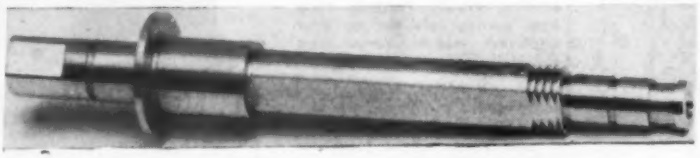
We offer a complete service for the Engineering, Development, and Manufacture of metal parts, assemblies, and machines.

Fully equipped, modern machine shop with complete production setup for all types of machine work.

Send blueprint or sample for prompt quotation without obligation.

SOUTH SHORE MACHINE & TOOL WORKS, INC.

Merrick Road **Seaford, New York**



Stainless Steel 303
Stock Size ½"
Overall length 3¾"

Diam. Tolerances .0003
Length Tolerances .002
} on all steps—Concentricity within .0005

Capacity Open for the Manufacture of PRECISION SHAFTS,

axles, spindles, etc. with tolerances to .0002" and delicate concentricity. Our past performances prove our expert production with rejections averaging less than 1%.

PRECISION PARTS, INC.

17 THOMPSON STREET
NEW YORK 13, N. Y.

COMPLETE MANUFACTURING FACILITIES

The following manufacturing facilities are available

A complete organization and plant to carry out the following processes: Tool Jigs, Fixtures and Gauges: General Machine Shop (including automatics): Press Shop: Sheet Metal Shop: Acetylene and Arc Welding: All kinds Electroplating: Spray-Painting: Wood-Working: Foundry (grey iron): Assembly Shop (light and medium).

Communicate with W. J. Anderson for additional information.

RELIANCE INDUSTRIES LIMITED

BELLEVILLE **ONTARIO**

CANADA

PHONE: 2470

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N.J.

(Makers of J.&S. Radii & Eagle Dressing Tools)

METAL STAMPINGS

• TOOLS • DIES •

PERMANENT MAGNETS

HEAT TREATING

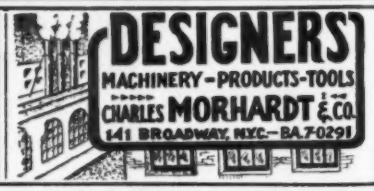
THOMAS & SKINNER STEEL PRODUCTS CO.

1103 E. 23rd St. INDIANAPOLIS, IND.

Long runs for Turret Lathe & Milling Machines.

VAHL ENGINEERING CO.

505 Court St. **Brooklyn, N. Y.**



WIRE AND METAL SPECIALISTS

in round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing.

EASTERN TOOL & MFG. CO.

BLOOMFIELD, N. J.

WANTED

WORK FOR THREE—3¼" and one 3¾" S. Spdl. Automatic Screw Machines.

BURKE MANUFACTURING CO.

1040 Bader St. **Cincinnati 20, Ohio**

CONTRACT WORK

• TOOL DESIGNING AND BUILDING • MACHINES DESIGNED • IDEAS DEVELOPED • PROMPT—EFFICIENT—SERVICE • • REASONABLE CHARGES •

OLD COLONY ENGINEERING CO.
180 Weeden St. • Pawtucket, R. I.
P.O. Box 672 • Tel. Blackstone 2610
Write — Phone or Telegraph

SCREW MACHINE PRODUCTS
STEEL—BRASS—ALUMINUM
MACHINE SHOP FACILITIES
•
TRANSOMATIC CORP. OF AMERICA
426-428 W. 55th St., N. Y. 19, N. Y.

CONTRACT WORK
We manufacture special Tools, Dies, Jigs, Fixtures, Parts and experimental work to your specifications. The closer the tolerance, the better we like it. Expert toolmakers and modern equipment are your guarantee of satisfaction. Your blueprints will receive prompt attention, whether you need one piece or a thousand.
ALL TOOL CO.
110 Long Ave. Hillside, N. J.
WAverly 3-7297

MOULD MAKERS
Specializing in molds for the Rubber Industry also facilities for automatic screw machine work up to 11/16.
M & N Machine Tool Works
146 Orono Street Clifton, N. J.

AVAILABLE MACHINE CAPACITY, turret lathes to 2½" diameter bar capacity. General machine shop work. Assemblies. Punches and dies, fixtures, etc.
Wayne Manufacturing Company
HONESDALE, PA.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

OPEN CAPACITY FOR
— TEMPLATES —
LOFTING — ENGINEERING
The TEMPLATE-CRAFT CO.
8085 LIVERNOIS AVE. DETROIT, MICH.
Phone Hogarth 5394

PRECISION MACHINE WORK

ON A CONTRACT BASIS EXACTLY TO YOUR SPECIFICATIONS . . . . . .

A complete and efficient service for the manufacture of machine parts, Special Tools, Fixtures, Etc., is available in our fully equipped modern shop.

Quality work guaranteed at reasonable cost. Send blue prints or samples for prompt quotation.

Robertson Tool Co., Inc.
424 Broadway, Malden, Mass.

FORGING ITEMS WANTED FOR
800 lb., 1000 lb., 10,000 lb. steam drop forging hammers.
2500 lb. and 3000 lb. board drop forging hammers.
1½", 2", and 4" upsetter type forging machines.
This forging equipment supplemented by flat die steam hammers, bulldozers, presses shears, etc.
Production machine shop for necessary machining.
Tool & die shop suitable for mfg. tools & dies required by forge & production shops. Capacity available as Navy forging contracts are completed.
Manufacturers Impression Die Forgings—Electrical and Mechanical Equipment
COVINGTON ELECTRICAL MECHANICAL COMPANY
BOWLING GREEN KENTUCKY

AVAILABLE SCREW CAPACITY
¼ to 4½ Automatic and Hand Screws
Including Necessary Secondary Operation
Forward Samples and Blueprints for Quotations
BRIDGEWATER SCREW PRODUCTS CO., Bridgewater, Mass.

Contract Work Available—see page 320

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES

UNDISPLAYED RATE:

(Not available for equipment advertising)

10 cents a word minimum charge $2.00.

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M. October 31st will appear in the issue of November 8th subject to limitation of space available

POSITIONS VACANT

TOOL DESIGN Engineer with Punch Press and Forge Shop experience. A. B. Chance Company, Centralia, Missouri.

WANTED: YOUNG, aggressive and experienced Master Mechanic to take charge of machine shop and plant maintenance of rerolling steel mill and fabricating shop. Give education and experience. P-475, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. Reconversion is creating lifetime opportunities now. This thoroughly organized confidential service of 35 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MECHANICAL ENGINEER, age 42, with tools, dies, special machine design experience, method engineer, research and development engineer with proved supervisory ability along the lines referenced above, desires supervisory position with a progressive company. PW-420, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ASSOCIATE EDITOR: M.E. and M.S. degrees, broad shop and technical experience; engineering journals, trade papers, house organs. PW-456, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 319)

TOOL ENGINEER AVAILABLE

for a position as supervisor in Production Engineering Department as Chief Tool Designer, Chief Process Engineer or Assistant to Production Engineer.

36 years old, high school and 4 years at Univ. of Cincinnati, College of Engineering. Employed for 5 years as tool designer by large machine tool company in Cincinnati. 4 years with U. S. Navy Dept.—2 years as tool designer and 2 years as Mechanical Engineer with special problems in Tool Engineering. For past year employed by a Navy owned, privately operated ordnance plant as Chief Tool Designer with 20 people under my supervision.

I have an excellent working knowledge of plant layout, processing, and the design of special machinery besides the "Know How" of Tool Engineering in the medium and heavy duty machinery field.

No objection to working in any part of the U. S. Further information and references supplied at your request.

PW-472, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

TO ABLE, AMBITIOUS MEN

in Administration, Manufacturing, Engineering, Designing and Sales, who have good reasons for seeking wider opportunities, we offer AT NO CHARGE a dignified means of bringing their qualifications before interested employers.

To Industry we offer confidential Personnel Management Service on a fee or retainer basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

WANTED

MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional post-war opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-345, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

INDUSTRIAL CONTROL ENGINEER

We are interested in securing an electrical engineer to develop industrial control apparatus.

Applicant should be familiar with competitive designs, and have working knowledge of tests and working methods. Underwriter's requirements and NEMA standards for electric motor control.

Excellnt opportunity to qualify for a permanent supervisory position in Engineering Department of an expanding organization well established in the automotive electrical and magnetic relay field. In applying give age and complete resume of experience.

R-B-M MANUFACTURING CO.
Division Essex Wire Corp.
LOGANSPORT INDIANA

WANTED

MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

THE TAFT-PEIRCE MFG. CO.
Woonsocket, R. I.

PRINTING EQUIPMENT DESIGNER & ENGINEER

Long established corporation in western New York having a line of nationally known products has opening for creative designer and engineer. Knowledge and experience with construction and operation of various types of printing methods and equipment, perforators, cutters and other machines ordinarily used by paper processing and printing establishments especially desirable. State education, experience, age, salary and availability.

P-468, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

MACHINE DESIGNER

Long established New York State corporation is offering permanent position to creative designer and engineer. This is an unusual opportunity for man who possesses adequate educational background, experience, originality and initiative—in a well-established and growing organization engaged in research and development as well as manufacturing and marketing of nationally known mechanical products. Office appliance experience especially desirable. State experience, age, education, salary and availability.

P-469, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

ENGINEERS—JUNIOR AND SENIOR

Must have thorough knowledge of modern machine tool design practice and must be willing to do board work. Excellent post war opportunities. Please give complete record of your past experience and address your replies to the

Personnel Director

THE CROSS COMPANY
3250 Bellevue Ave., Detroit 7, Mich.

SEARCHLIGHT SECTION

POSITIONS WANTED

(Continued from page 318)

SALE ADMINISTRATOR: or top executive assistant, experienced in marketing and the new products. M.E. Cornell University—for the last twenty years employed with a firm manufacturing and selling technical hardware specialties as executive in the following positions—vice president, secretary-treasurer, general manager, sales manager, in charge of manufacturing, merchandising, organizing sales force, training and advertising. Basic training in engineering and sales power plant equipment. Position wanted with company manufacturing technical, semi-technical products planning postwar developments. PW-455, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF ENGINEER: Mechanical and Master's degrees, good executive and organizer; machine tools, automatic machinery, medium and heavy machinery, gearing; design, mathematical analysis, research. PW-457, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF DRAFTSMAN: Technical graduate, mechanical engineer's degree; actual designing and shop experience directing production of many types of machinery, organizer, instructor, producer. PW-458, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PROCESS AND Tool Engineer—familiar with the processing of machined and electronic parts, tools, and gages, precision inspection, plant layout and standards. 15 years of industrial experience. Engineering degree, 37 years old. Desires position as a process engineer, inspection supervisor, or as assistant plant manager. PW-476, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

GENERAL MANAGER or principal operating executive. 17 years principal operating executive, supervising activities of as many as 7000 in engineering, shop supervision, planning, procurement, personnel relations and at times jobbing sales. Most of this period as chief executive of subsidiary plants, headquarters located elsewhere. Enviable record for low manufacturing cost, good industrial relations and maintenance of a working team. Titles held: Vice President and Director. Average earnings $15,000.00, age 52, B.S. degree. PW-477, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

ROBERT DALEY—registered patent attorney engineer. 19 S. La Salle St., Chicago 3, preliminary consultation without obligation.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives

Salesmen—Additional Lines

OFFERED

REPRESENTATIVE WANTED to sell a line of tool room specialties, direct to tool and machine shops. Frank McMahon Co., 142 S. June St., Dayton 3, Ohio.

REPRESENTATIVE FOR New England and other territories having excellent contacts with users of diamond tools and diamond wheels, wanted by an important manufacturer. Those presently engaged in the line or/and in the sale of grinding wheels or carbide tipped tools preferred. Commission basis. RW-478, American Machinist, 330 W. 42nd St., N. Y. 18, N. Y.

WANTED

SALES MANAGER: traveling three trips yearly for the past ten years in the United States and Canada calling on 420 manufacturers representatives and mill supply companies with approximately 1700 men wants two additional lines on straight commission basis for National distribution. Prefer a machine tool line or precision tools. Reference exchanged at personal interview. RA-461, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED
PLANT MANAGER

A successful aggressive company located in a midwestern city is entering the business of manufacturing agricultural implements with an estimated starting personnel of about 300 employees. We require the services of a man of outstanding and proven ability with an engineering background. Must appreciate the necessity of thorough planning for efficient production and have a completely rounded out experience in directing every phase of manufacturing detail. If you enjoy working with executives of exacting integrity who are developing a well rounded out organization building a sound product, give us your occupational record with names and addresses of supervisors, age, and any information that will help us determine your fitness for the job. A thorough check of your record will be made if we are interested, but we will not correspond with your present employer. Your travel expense will be paid to the plant if we ask for an interview. Initial salary $12,000 with possible future participation in earnings.

P-474, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

DRAFTSMEN — DESIGNERS

Needed in the Development and Research Department of an old established and progressive Chicago manufacturing company. Excellent opportunity for men with ingenuity and designing ability. Experience in drafting and designing small mechanical and electrical devices is required. Engineering degree desirable but optional.

P-429, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

TOOL ROOM FOREMAN

Excellent opportunity. Stable and progressive concern—Western New York. Age 35-45. Die experience essential. Write giving details of experience, education, personal data and photo.

P-471, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

WANTED

FIRST CLASS ENGINEER with practical experience in Machine Tool Design. Write giving resume of past experience, salary expected, and when available.

P-470, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

Are You Seeking or Offering

— business

— equipment

— employment

"OPPORTUNITIES"?

To fill any of these "industry wants" a logical source is found in this Searchlight Section—Classified Advertising.

Experience has shown that the Searchlight Section produces quick results because it spotlights current opportunities of special interest to the readers of AMERICAN MACHINIST—management and production executives in the metal-working industry.

Use "Searchlight"—at low cost—to feature your wants or offerings . . . whether it concerns employment, buying or selling used or surplus new equipment, or other pertinent business "opportunities."

WANTED
SALES ENGINEERS

To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

SW-410, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Prominent Australian Company

With representative visiting the United States of America and Canada, wishes to augment its Agency business and is ready to represent in Australia, the manufacturers of Ships, Dredges, Diesel Engines, Winches, Windlasses, anti-fouling Paints, Tool Steels, etc., prefabricated houses, and manufactured articles for Agriculture, Mining, Shipping, Building, Hardware and Foundry Trades.

Please write to:—"TRADE LINK"
C/—Australian Trade Commissioner's Office
6630 Fifth Avenue New York

SALES ENGINEERING

This new organization is interested in the sales and distribution of precision measuring tools and devices, small metalworking tools and attachments, etc. We invite correspondence from manufacturers of high class equipment who may be looking for first class representation.
Our activities will be limited strictly to accounts within the State of Ohio where we have a wide acquaintance among manufacturers and small shops.
BRADY ENGINEERING SERVICE, Sidney, Ohio

LARGE SWISS IMPORTER SPECIALIZING IN METAL INDUSTRY LOOKING FOR EXCLUSIVE AGENCY FOR MACHINES AND TOOLS.

R. SCHENK, LTD.
Berne Switzerland

MANUFACTURERS

Sales Engineer covering New England and eastern New York wants line of anti-friction bearings and affiliated lines. Exceptionally well known. *Address*

RA-447, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

Managing Director

Of large Steel Foundry and Engineering Works in Australia will be visiting The United States of America and Canada shortly seeking arrangements to manufacture proprietary and standard lines particularly those involving steel castings although also capacity for cast iron. Any special Plastic proposition would also be investigated. All communications addressed to

"STABILITY",
C/—The Union Bank of Australia Limited,
C/—Brown Bros. Harriman & Co.,
Wall Street, New York
will receive careful attention.

Additional Business Opportunity & Wanted Advertising on page 320

UNUSUAL OPPORTUNITY

See our advertisement for Contract Work on page 317

The owner of the plant advertised above wishes to develop the plant into a larger, more efficient operation, therefore, consideration will be given to the following

The sale of fifteen percent (15%) interests to three reliable individuals who are experienced in the metal working field. Specialists in sales, engineering and executive management are desired in order to create most efficient development.

Interested parties who qualify after thorough investigation will be given full details relative to the business.

Proposition will justify thorough investigation as it is not a high priced idea but is a reasonably priced concrete plan to continue the development of a business that has been operated by this owner for the past twelve years in the same city.

COVINGTON ELECTRICAL MECHANICAL CO.
BOWLING GREEN **KENTUCKY**

MACHINING FACILITIES NEEDED

A world recognized leader in the manufacture of heavy machinery finds its facilities inadequate to manufacture an anticipated surge of orders. Would like to locate a shop equipped to manufacture its machines and interested in doing so. Among machine facilities required are welding shop, 72"x72"x24 ft. planer, large horizontal boring mill, 28"x8 ft. cylindrical grinder and 6 ft. radial drill.

CW-473, AMERICAN MACHINIST
330 WEST 42nd STREET **NEW YORK 18, N. Y.**

FOR SALE

NO. 26 NORTON HYPROLAP

In perfect condition—

Complete and ready to run—
Used only 5 months.

Original Cost.....$7,073.00
Sale Price $3,500.00

VULCAN BEARING MACHINE CO.
2504 Commerce St. Dallas 1, Texas

TO HELP YOU . . .

find equipment you need

"Searchlight" Advertising

WANTED

For Urgent Production

SELL DIRECT TO USER

2—Straightside, Double Crank Presses 50" to 72" Bet. Housings. 125 to 200 Tons.

4—Open Back Presses 6" to 12" stroke. 60 to 100 Tons. 12" min. die space.

Also other similar stamping presses, shears, brakes and sheet metal equipment

WRITE, PHONE OR WIRE COLLECT

OK MACHINE CO.
Phone Harrison 2214
2131 Fairfield Ave., Ft. Wayne 6, Ind.

WANTED

WIRE FORMING EQUIPMENT

NILSON 4-SLIDE MACHINES.
ANY TYPE—ANY SIZE.
PLEASE WRITE TO

W-467, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

New or used Bobby-Pin machine. *Write full details to*

ELKINS PRODUCTS CO.
45 Seymour St. Stratford, Conn.

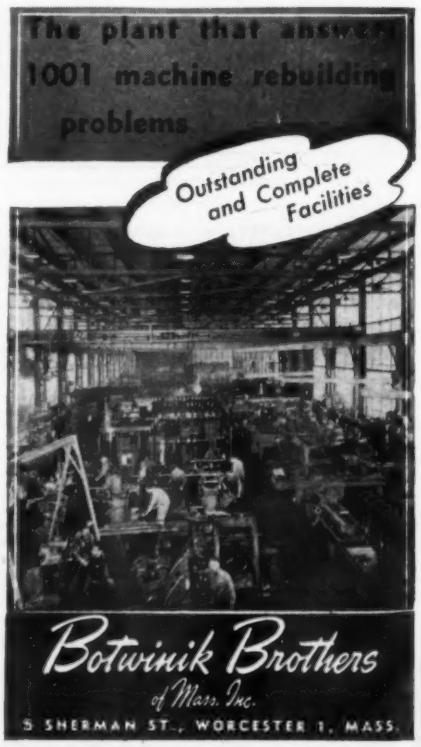
WANTED

PUNCH having the following specifications

Width of ram and base	14"
Length of ram and base	42"
Height of die space	16"
Stroke	2"
Capacity	300 tons

WEST VIRGINIA STEEL AND MANUFACTURING COMPANY
P. O. Box 118
Huntington 6, West Virginia

REBUILDING



EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 4-Spindle Automatic.
2—#55 National Acme 1⅝" 4-spindle Automatics, complete.
1—#2G Brown & Sharpe Automatic.
1—#1 Brown & Sharpe Automatic, old style.
#0 Brown & Sharpe Automatic, Belt Drive.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13" high speed, 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

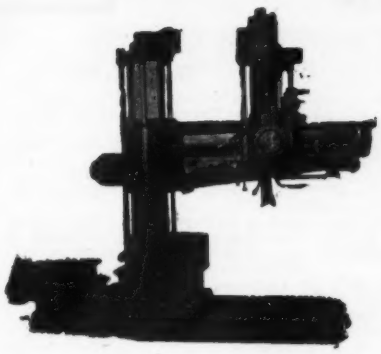
3' 9" col. American, S.P.D.
3' Dreses, 10" rd. col. QCG., M.D.
3' Fosdick 10" Col. Motor Drive.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
6"x32" Norton Cyl., overhead c/s drive.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
3—#2 Cincinnati Centerless Grinders.
1—4x12 Landis Hydraulic Cylindrical Grinder, New.

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

14 x 6 Pratt & Whitney semi—Q.C.G.
16 x 8 Hendey Arranged M.D., Taper
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
14 x 6 Hendey Toolroom Lathe, G.H., M.D.
14x8 LeBlond Toolroom Lathe, cone drive.
14"x6' Hendey 12-speed geared head.
14"x102" centers Hendey motor driven Lathe.
20" x 10' Hendey.

MILLING MACHINES

#3, #4, #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Millers.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.
#1-#2—Kempsmith Plain Milling Machines
#2½ #3 LeBlond Universal.

PLANERS

30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.
24" x 24"x 6' Cincinnati, 2 heads, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C. B.G. Forging 3" stroke.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
7—25 ton Model SL2 K.R. Wilson hydraulic Presses.
Beck Duplex Embossing Press.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Will draw and lift out 2¾".

SHAPERS AND GEAR CUTTERS

12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
#13 Brown & Sharpe Spur & Bevel Gear Cutter.
16" Smith & Mills.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #9S Power Seamer.
Niagara 4"x42" Geared Slip Roll Former.
Niagara 3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller. 6 Roll.
Niagara #4-E Squaring Shear, 48" x ¼" capacity, M.D.
Cleveland 8' x ⅜ Plate Shear.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open die, ½" cap. & 6".

Manville Cold Header, single stroke, solid die, 3/16" cap.

J. C. Miller Co. Lacquer Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
High Speed Riveter, #5B.

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No. 61—1⅝" NEW BRITAIN SIX SPINDLE AUTOMATIC SCREW MACHINE, with bar equipment, new in 1943.
No. 2 WARNER & SWASEY TURRET LATHE twelve speed, all geared head, with power bar feed, new in 1941.

AUTOMATICS

⅞" Cleveland Model M, four spindle.
⅞" Gridley Model F, four spindle.
2" Cleveland Model A, single spindle.
1" x 5" New Britain, six spindle.

DRILLS

★ **4 Ft. Canedy-Otto Radial Drill, motor spindle, 11" column, new in 1942.**
No. 416 Baker, single spindle.
★ **21" Cincinnati-Bickford Direct Motor Driven Drill, single spindle.**
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ **No. 3 Baush Multiple Drill, 20 spindle.**
No. 2 Morse taper, rectangular head 20" x 40".

GEAR CUTTERS

★ **No. 7, 71A, 715A Fellows Gear Shapers, all manufactured in 1936, with spur or helical guides, motor driven.**
No. 6 Fellows Gear Shaper, m.d.
★ **96" Gleason Spur & Bevel Gear Planer.**
No. 12 Barber Colman Gear Hobber.
No. 5-60" Brown & Sharpe Automatic Gear Cutter.

GRINDERS

★ **15" x 15" x 96" Norton Surface Grinder, m.d.**
No. 16-26" and No. 16-30" Blanchard Surface Grinder.
30" Diamond Face Grinder, m.d.
★ **No. 214-30" Besly Disc Grinder.**
No. 72A3 Heald Gagematic Internal Grinder.
No. 70 and 75 Heald Internal Grinders.
★ **No. 35 Excello Thread Grinder, new in 1941.**
No. 13 Brown & Sharpe Universal & Tool Grinder.
6" x 32" Norton Cylindrical Grinder.
10" x 36" "Hill-Clarke" Norton Cylindrical Grinder.
No. 2 Cincinnati Centerless.
★ **No. 3 Cincinnati Centerless Grinder, m.d.**

LATHES, ENGINES

★ **30" x 14' LeBlonde Heavy Duty, c.d.**
24" x 30' Lodge & Shipley, g.h.
★ **18" x 8' American, 8 speed geared head.**
16" x 6' Pratt & Whitney, c.d., with relieving attachment.
★ **8" x 60" Fitchburg Lo-Swing, g.h.**

LATHES, TURRET

★ **No. 4L Gisholt, 9¼" spindle, chucking.**
No. 1A, 2A Warner & Swasey.
2¼" x 24" Jones & Lamson, chucking, serial 40269.
★ **No. 6D Potter & Johnston Automatic Chucking and Turning Machine.**
No. 5A and No. 6A Potter & Johnston.
No. 4, 6, Warner & Swasey, c.d.
★ **42" Bullard VTL, New Era type.**

MILLS

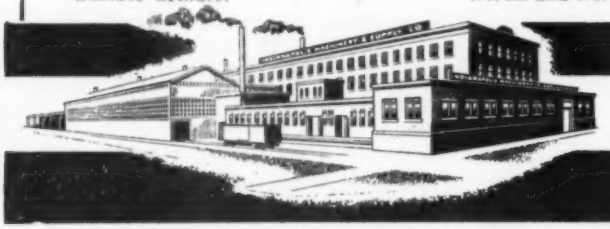
★ **No. 3B Milwaukee Universal, double overarm, m.d.**
No. 2 Cincinnati Universal.
No. 4 LeBlonde Plain, c.d.
★ **No. 2 Milwaukee Plain, double overarm, motor in base.**
No. 1A Milwaukee Plain, s.p.d.
★ **No. MM5 U. S. Multimiller, motor in base.**
18" Cincinnati Plain Mfg., s.p.d.
39" x 36" x 16' Ingersoll Rail Type.
No. 2 Milwaukee Vertical, motor in base.
★ **3" Universal Horizontal Boring, m.d.**
6" x 14", 6" x 48", P. & W. Thread Mill.
4" Pratt & Whitney Spline Mill.

PLANERS

36" x 36" x 10' Woodward & Powell Planer, 2 heads.
24" x 24" x 8' American Planer, one head.
25" Smith & Mills Crank Shaper.
★ **6" Pratt & Whitney Vertical Shaper.**
4" Stevens Vertical Slotter, m.d.

SAWS

★ **No. 6 Marvel Hack Saw, cabinet base with tank.**
No. 4B Marvel Hack Saw.



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AUTOMATICS, Acme 9/16" & 1" Mod. C 5 spdle.
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AUTOMATICS, Gridley, 9/16", ⅞ & 1¼" Mod. G
AUTOMATICS, Cone, 1⅛, 2½ & 3½" 4 spdle
CONOMATIC, 1⅛—6 spindle, M.D.
AUTOMATICS, Gridley, ⅝, 1¼, 1⅝, 2¼" & 2⅝" Model F, M.D.
AUTOMATICS, Gridley, 2⅛, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland 1¼, 1⅝, 2, 2½, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, New Britain #22 and 24 Chuckers
AUTOMATICS, Cleveland 3½" 4 spdle, Model K4
AUTOMATICS, Potter & Johnson #5a & 6a, M.D.
BORING MILLS, 20" Bullard, M.D.
BORING MILLS, Rockford, 3½" bar, Horizontal, 24x72" table, M.D. & 3½" Universal, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GENERATOR, Gleason Spiral Bevel Gear, 16"
GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hydraulic, 2 M.D.
GRINDERS, Bryant #3, 6 & 18 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 12" Vertical Surface, M.D., 9x31", Magnetic Chuck
LATHES, Hendey, 16"x8' & 8' & 18"x10'
LATHES, Rockford, 18"x8' Geared Head, M.D.
MILLING MACHINES, #3 B Hvy. B&S Plain
MILLING MACHINES, Becker Vertical #5 & 6
MILLING MACHINE, Milwaukee #1B Plain & Universal #3B Plain, M.D.
MILLING MACHINES, #3 B Rockford Universal
PLANER, Gray 30"x30"x8' 2 Rail Heads
PLANER, Ohio 42"x42"x12' One Head, M.D.
PLANER-SHAPER, 30" Cincinnati, M.D.
THREAD ROLLER, ⅝" National Hydraulic, M.D.

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- #3KM Kearney & Trecker Vertical Miller, rotary table, 1940
- #2MS Cincinnati Dial Type Plain Miller, 1940
- #2S Van Norman Plain Miller, 1942
- 48" Cincinnati HYDROTEL 4-spindle Vertical Miller, 1940
- 36" Bullard HIGH SPEED Vertical Turret Lathe, 1940
- #5 Jones & Lamson Ram Type Turret Lathe, bar and chucking, 1940
- 12" Hendey High Speed Crank Shaper, 1940

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PLANER, METAL—WOODWARD & POWELL 30"x30"x8', 1 rail head, 1 side head.
TURRET LATHES—FOSTER No. 1-B, Univ., inc. 2 Wrenchless Chucks, etc. M.D.; also W & S No. 2-A, Univ.
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High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

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ENGINE LATHES

10"x20" Pratt & Whitney Bench, m.d.
12"x8' Lodge & Shipley Selec. Head, m.d. in base
14"x6' American, geared head, m.d., taper, collet attach.
14"x6' Pratt & Whitney, cone
14"x8' Pratt & Whitney, cone, with turret
18"x7' Chard, cone
18"x8' Lodge & Shipley, cone, motorized
18"x8' Rockford, cone
18"x102" centers Lodge & Shipley Selec. Head, m.d. in base, taper, latest type
18"x106" centers Lodge & Shipley, same as above
18"x120" centers Monarch, m.d. in base, taper, latest type
18"x18' bed Lodge & Shipley Selec. Head, m.d., taper
20"x13' bed Springfield Geared Head, m.d., taper
22"x16' centers American 100 H.P. Input Super Lathe, m.d., p.r.t., weight 65,000 lbs.
24"x7' centers LeBlond Geared Head, m.d.
24"x14' American Geared Head, m.d.
24"x16' New Haven, Cone
24"x16' American Geared Head, m.d.
24"x16' Niles-Bement-Pond, cone, taper
24"x30' Schumacher-Boye, cone
26"x12' Schumacher-Boye, cone
27"x16' LeBlond, cone
30"x12'6" Niles-Bement-Pond Geared Head, m.d., taper
30"x13'6" Niles-Bement-Pond Geared Head, m.d.
30"x26' Lodge & Shipley Selective Head, m.d.
30"x28' (20' centers) Niles-Bement-Pond Time Saver Geared Head, m.d., latest type
36"x10' Putnam, cone, motorized
36"x12' Wright, cone
36"x14' Boye & Emmes, cone, motorized
36"x20' American Geared Head, m.d.
36"x28'6" (20' centers) Niles Heavy Duty Geared Head, m.d., taper, latest type
36"x28'6" Niles-H.D. Geared Head, m.d., latest type
36"x36'6" (28' centers) Niles Heavy Duty, m.d., 2 carriages, latest type
42"x26' American Geared Head, m.d.

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No. 9 Heavy LeBlond Multi-Cut, m.d.
3½x36" Lo Swing, s.p.d.
3x80" LoSwing, s.p.d.
8x84" LoSwing, m.d.
8x132" LoSwing, m.d., hardened ways, latest type
9x14" Porter-Cable Mfg., m.d.
11x28" centers Reed Speed Lathe, m.d.
13x24" Coulter Automatic Threading, m.d.
13x96" centers Automatic Threading, m.d.
17x124" centers LeBlond Rapid Production, m.d. in base, latest type
No. 5—42x96" Niles-Bement-Pond Center Driving Car Wheel Lathe, m.d., new
Niles-Bement-Pond Quartering Machine, m.d., new

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No. 2A Brown & Sharpe Universal, m.d.
No. 2L Cincinnati Universal, m.d. in base, latest type
No. 3A Brown & Sharpe Universal, m.d.
No. 4A Brown & Sharpe Universal, m.d.
No. 4 Cincinnati Universal H.P., m.d.
No. 4B Milwaukee Universal, m.d.
No. 000 Brown & Sharpe Plain, m.d.
No. 2L Cincinnati Plain, m.d. in base
No. 3B Brown & Sharpe Plain, m.d.
No. 3B Milwaukee Plain Double Overarm, m.d.
No. 4B Brown & Sharpe Plain, m.d. in base, double overarm
No. 4 Cincinnati Plain H.P., m.d.
No. 4 Milwaukee Heavy Plain, m.d. in base
No. 4K Milwaukee Plain Dial Type, m.d. in base, latest type
No. 5B Heavy Brown & Sharpe Plain, s.p.d.

VERTICAL MILLING MACHINES

No. 1 Beaman & Smith, m.d.
No. 2 Brown & Sharpe, sp.d.
No. 2 Cincinnati, m.d.
No. 3 Cincinnati, m.d.
No. 3B Milwaukee, m.d. in base
No. 3B Milwaukee, m.d.
No. 3V Toledo, sp.d.
No. 4 Cincinnati H.P., m.d., latest
No. 4 Cincinnati H.P., m.d.
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice Vertical and Die Sinker, m.d., latest type
No. 6 Becker, cone
2 spindle Newton, m.d.

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2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

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66", 120" Niles
54" Colburn, M.D., 2 hds.

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Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

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P. & W. 14", 18", B.B., Vert., M.D.
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Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
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Norton 10x36" Hydraulic, M.D.
Badger 24" Dble Opposed, M.D.
B. & S. No 10, 1' Cyl.
No. 2 Cincinnati, Centerless, M. D.
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McCabe 26-42"x14'
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P. & W. 1x18, 1¼x18 Automatic Lathes

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B. & S. No. 2, 6F Hand Screw
B. & S. No. 00, 0
5 Spdle. Davenport 9/16" cap.
Cleveland Model A ½", 5/8", 1¼", 2"
Cleveland Model B 1", 2"
P & J. 6A, M.D.
⅞" Cone 4 spindle

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5, 10, 20 ton OBI Power Presses
7" Ammco Shapers
Halco Vertical Milling Heads, Drill Presses
Kalamazoo Metal Band Saw

RADIALS

3', 4', 5', 6', 8' American Triple Purpose
3', 3½', 4', 5' Cincinnati-Bickford
4' Mueller. M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

10" P. & W. Auto.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 2, 3 Dbl. overarm
B. & S. No. 2, 3, Vert
Milwaukee No. 2½ B Vert.
Kempsmith No. 1 Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5½ B Hammer
Baker #2 Keyseater 5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
Natco No. 13 Multiple Spindle Drill
48" Southwark gate shear ½" 24" gap.
6' Hilles & Jones Roll

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1—#3 Gisholt Universal Turret Lathe, new 1943.

2—#3 Bardons & Oliver Universal Turret Lathes with bar feeds.

1—#2 B&S Light type vertical miller.

1—#5 B&S 8"x24" Hydraulic Surface Grinder.

1—#5 B&S 3"x18" Cylindrical Grinder.

1—#2 Wickman "Swiss type" Automatic Screw Machine with end drilling and tapping attachment, brand new never used.

2—#12 B&S Plain Automatic Millers, electrically controlled, new 1943.

2—#000 B&S Plain Automatic Millers.

5—U.S. Multimatic "Plain" Production Millers.

1—16" Lodge & Shipley Geared head engine Lathe, new 1940 or 1941.

1—#2SL LaPointe Horizontal Hydraulic Broaching Machine, new June 1944.

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6' American Plain Radial Drill, M.D.
#3 Cincinnati Vertical Milling Machine H.P.
38"-44" Niles-Bement-Pond Vertical Boring Mill M.D.

HEAVY DUTY MACHINE TOOLS

52" Bullard Vertical Boring & Turning Mill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
7' American Triple Purpose, Motor on arm.
27"x16' Lodge & Shipley Grd. Hd. Tapers.
30"x14' Schumacher & Boye Lathe, Q.C.
10' Cincinnati Heavy Duty Boring Mill, M.D.
12' Niles-Bement-Pond Heavy Duty Boring Mill, M.D.

GRINDERS

12"x96" Landis Plain, S.C.
18"x85" Landis Plain Self contained.
#78 Covel Hanchett Surface.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#1 Adams Gear Hobbers.
#1 Schuchart & Schutte Gear Hobber.
#3 Adams Farwell Gear Hobber.
#61 Fellows Gear Shaper, Cone drive.

PLANERS

96"x96"x36' Cincinnati 4 Hds. M.D.
48"x60"x26' American 4 Heads.
30"x30"x8' Gray Planer.

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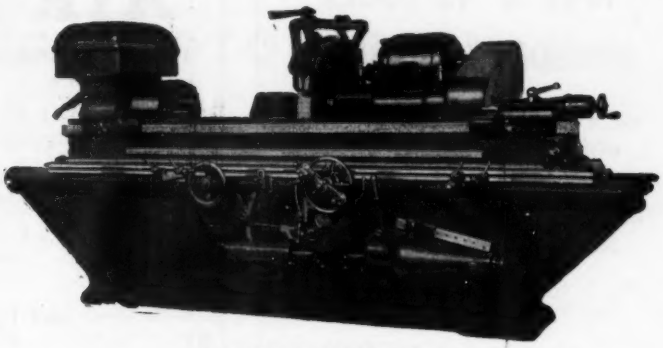
HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x120	16x36	

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke patented Multiple V-belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

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BORING MILLS—Horiz.—Vert.

BULLARD 42" Vert. N.E. type—M.D.
GISHOLT 42" Vert.—2 heads
N.B.P. 1½" bar Portable floor type—Horiz.

DRILL PRESSES

AVEY No. 3, single spindle
AVEY No. 2, 3-spindle
COLBURN D-2 Upright
NATCO No. 12, multiple spindle

GEAR CUTTERS

BROWN & SHARPE No. 13
FELLOWS No. 712
GOULD & EBERHARDT 36" Hobber

GEAR GENERATORS

GLEASON 3" and 6" Straight
GLEASON 10" and 15" Spiral
GLEASON 12" Straight

GRINDERS

NORTON 24" x 240" Plain
ARTER 8" Rotary Surface
ARTER Automatic Piston Ring
UNIVERSAL Hydraulic Spline Shaft
BROWN & SHARPE #4 Universal

LATHES—Engine & Turret

SOUTH BEND 11" x 4'
LeBLOND 25" x 18' geared head
LODGE & SHIPLEY 30" x 26'; 2-carriages
MOREY #26 Turret; 1" capacity
MOREY No. 3 Universal Turret; 1½" capacity
MOREY #4 Universal Turret; 2" capacity
WARNER & SWASEY No. 3A Univ. Turret

MILLING MACHINES

BROWN & SHARPE No. 3A Universal
MILWAUKEE No. 3B Universal
CINCINNATI No. 3 Vertical
BROWN & SHARPE No. 3 Vertical
MOREY 12" x 60" Thread
PRATT & WHITNEY 6"x20" Thread Model B
PRATT & WHITNEY 6x132" Thread
RICE BARTON 4" Duplex Spline
PRATT & WHITNEY 4" Spline
INGERSOLL 48"x48"x16' Adj. Rail, 4 swivel heads
INGERSOLL 36"x33"x8' Adj. Rail, planer type; 3 heads

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GRAY 24"x24"x6'—1 head
CINCINNATI 36"x36"x10'—4 heads
CINCINNATI 120" x 96" x 20' rapid traverse —4 heads; DC reversing motor drive
HAMILTON 42"x42"x20'—4 heads; DC motor drive
GRAY 48"x48"x16'—4 heads
GRAY 72"x48"x12'—2 heads
WOODWARD & POWELL 60"x60"x20'—4 heads

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MOREY 8" and 12" Vertical
PRATT & WHITNEY 6" and 10" Vertical
MORTON 30" Draw Cut—Horizontal

MISCELLANEOUS

DILL 18" Slotter
ESPEN LUCAS No. 138 Cold Saw—12" Cap.
SAUNDERS 8-18" Pipe Machine
TREADWELL 12" Pipe Machine
MORTON 60" Stroke Planing & Boring Machine

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IMMEDIATE DELIVERY

No. 4 Cincinnati High Power Miller with Turchan follower or duplicating attachment.

No. 2 Cincinnati Medium Speed Dial Type vertical miller.

No. 2 Cincinnati Medium Speed Dial Type plain miller.

2½" capacity No. 7A Jones & Lamson saddle type turret lathe with lot of equipment.

14" Pratt & Whitney hydraulic feed vertical surface grinder with magnetic chuck.

12" Betts Heavy Duty crank slotter.

No. 5 Plan-O-Mill thread miller, hydraulic feed.

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BROACH. Twin 10 Oilgear duplex hydraulic.

BROACH. No. 2S Lapointe hydraulic

BROACH. No. 1 Foote Burt vert. surf. hydr.

BUFFER. No. 40 Standard Elec. NEW.

DRILL. 21" Canedy Otto upright. NEW.

GEAR SHAPERS. Nos. 7 & Z1 Fellows

GEAR HOBBERS. Nos. 16HS & 18H G. & E.

GRINDER. 6"x18" Thompson hydr. surface

GRINDER. 12"x36" Grand Rapids hydr. surf.

GRINDER. 16", No. 10 Blanchard surface

GRINDER. No. 2 Cincinnati centerless

GRINDER. No. 2 Brown & Sharpe univ.

GRINDER. No. 72A3 Heald Sizematic Internal.

LATHE. 14"x18" Monarch Magnamatic

LATHE. 15"x22½" Sundstrand automatic stub.

MILLER. No. 1½ Standard Hand. NEW

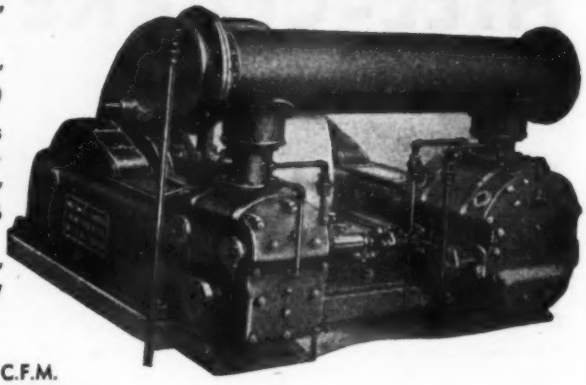
MILLER. No. 2 Kent Owens Hand.

MILLER. Ingersoll rotary & planer type (11)

SHAPER. 32" Morton draw-cut, M.D.

MILES MACHINERY CO.
SAGINAW MICH.

AIR COMPRESSORS



1—Model A-8 3"x2½" Quincy (new)

2—Model AA-12 2½" x2½" Quincy (new)

1—Ingersoll Rand Gas Engine 105 C.F.M.

1—Ingersoll Rand 8½" x4½" x 10" 106 C.F.M.

1—Ingersoll Rand 12" x7½" x 12" 327 C.F.M.

1—Bury Type BP4H 15" x 9" x 12" 546 C.F.M.

1—Sullivan Class WJ3 788 C.F.M.

1—Chicago Pneumatic 22" x 14" x 16" 1055 C.F.M.

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AVAILABLE FOR IMMEDIATE DELIVERY

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875 W. 120th STREET CHICAGO 43, ILL.

1—Rockwell Hardness Tester as manufactured by Clark Equipment Co., their Model C-12. This instrument was purchased approximately December 1, 1944, for $385.00 and has been used periodically since.

1—Electric Arc Furnace, Model GMS, Detroit Rocking Electric Furnace purchased new from Kuhlman Electric Co., Bay City, Michigan on Febr., 1945 for $2075.00, 50 KVA at 220V-60 cycles, capacity 75-90# per heat cold, 120# per heat hot. This equipment has been used periodically since March, 1945 but is in new condition.

1—High Frequency Induction Furnace, 16 KVA capacity manufactured by Ecco High Frequency Corp., North Bergen, N. J. Purchased June, 1945 for $2750.00 received but never production operated.

1—Electric Heat Treat Furnace, Lindberg Electric Vertical Cyclone, Model 2530EH, maximum operating temperature, 1450 degree. Work baskets 25" x 30" deep. Complete with Leeds & Northrop potentiometer and controls. This furnace purchased January, 1945 for approximately $2800.00, but was never hooked up.

FS-398, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

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30"x26' Lodge & Shipley 12 speed Geared Head, M.D.
32"x35' Wickes Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' Putnam Geared D.C. M.D.

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Grinder, Surface, Wilmarth & Norman—8" x 24"
Grinder, Tool & Cutter, B. & S. No. 13
Grinder, Tool & Cutter, Norton
Shaper, Gould & Eberhardt 16-Inch
Shaper, Rockford, 16-Inch
Shaper, Potter & Johnson, 24-Inch
Drill, Milwaukee, 21"
Drill, Sipp, 2 Spindle, H.S. 8-Inch Sensitive 9-Inch overhang.
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400 W. Laketon Avenue Muskegon, Mich.

For Sale
1⅞" Cone Automatics

4 Spindle—Motor Drive

These Units were built in 1930, but reconditioned recently—"Now in Operation"—Complete with Stock Reels, Collets, Pushers, auxiliary Spindles, and about $2,000.00 inventory of repair parts.

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Watson Stillman rebuilt 48" single daylight opening, downward double acting ram 16" dia. by 21" stroke, platen 24"x24" with clear space left to right 30¼" between 5½" dia. strain rods. We will purchase your Surplus Equipment.

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BORING MILLS—Horizontal; Vertical

LUCAS No. 41, 3" bar—Horizontal
LUCAS No. 42, 4" Bar, Horizontal
BULLARD 36" spiral drive Vertical Turret Lathe with side heads
BULLARD 24" spiral drive Vertical Turret Lathe with side head

LATHES

MONARCH 14"x30" between centers, 16-speed head
MONARCH 14"x54" between centers, 16-speed head
MONARCH 16"x54" between centers, 16-speed head
MONARCH 18"x72" between centers, 16-speed head
LODGE & SHIPLEY 16"x72" between centers, 12-speed head
LeBLOND 18"x72" between centers, 16-speed head

TURRET LATHES

WARNER & SWASEY No. 2; 1" capacity
WARNER & SWASEY #4 Universal; 2" Capacity
MOREY No. 2G Turret; 1" capacity
MOREY No. 3 Universal; 1½" capacity
MOREY No. 4 Universal; 2" capacity

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AMERICAN Hole-Wizard 4' Plain; 11" column
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BLANCHARD #18 Vertical—30" chuck
THOMPSON 24" wide, 96" table; surface
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BROWN & SHARPE No. 3 Universal

MILLING MACHINES

MILWAUKEE No. 2H Plain
MILWAUKEE No. 3H Plain
MILWAUKEE No. 2H Universal
VAN NORMAN No. 12 Universal
VAN NORMAN No. 26 Universal
VAN NORMAN No. 36 Universal
PRATT WHITNEY 4½"x12" Thread, Model C
MOREY-SHIELDS 12"x60" Thread
CINCINNATI #3 Vertical

GEAR CUTTING MACHINE

GLEASON 12" Bevel

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MOREY 12" Vertical—MOREY 8" Vertical

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Drill, high speed 7' over hang single spindle
Drill, two-spindle sensitive, #1 Morse taper
Drill, 4-spindle sensitive
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
HackSaw, 12 x 12 Racine
Milling machine #3 Rockford Universal
Two 18"x8' Mueller lathes, H.S. quick change gear
One 16"x8' Hendey Lathe
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear two ½" & ⅝" capacity
Shaper 24" Gould & Eberhardt
Shaper, 16" Barker
Threading Machine #0 Webster & Perks
Tool Grinder Sellers new #0, #1 and #2 magic chuck and collets

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5" Bar Newark Horizontal Boring Mill, 8' Bed, M.D., $2250.00
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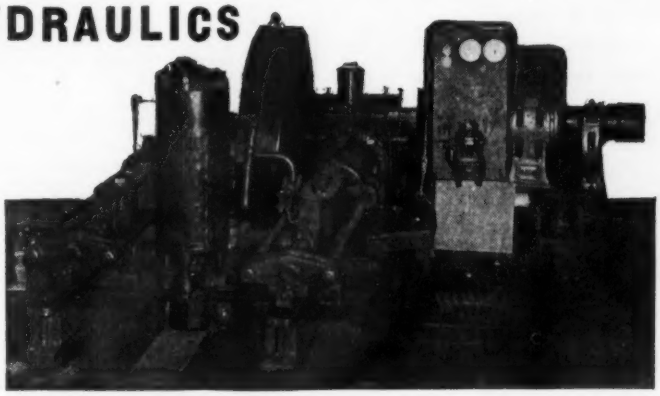

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2300 Volt Synchronous Motor 3 Phase 60 Cycle
ALSO—75 H.P. Hor. 4 Pl. Pump—50 G.P.M.—2000#
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18"x15' Accumulator 1500#
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Can be seen in operation.

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3—Cincinnati Bickford 4' Motor on Arm

LATHES

5—Hendey 12 x 5 Yoke Head

2—Hendey 14 x 6 Gear Head, Motor in Base

1—Hendey 16 x 6 Yoke Head

3—South Bend 10' Q.C.G.—1" capacity

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1—#2 Warner & Swasey

1—#2A W&S 4½ cap.

3—#3 W&S 1½ cap.

3—#4 W&S 1½ cap.

2—#5 W&S 2-3/16 cap.

All Warner & Swasey turrets are Timken bearing, motor in base equipped with box feed & chucking.

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(7) Gorton & Deckel Engraving Machines

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(3) #0G Brown & Sharpe

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1—36"x36"x8' Cincinnati single head planer with 10 H.P. G. E. Motor good condition $550.00

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1—#0 B. & S. automatic screw machine, belt drive. $850.00

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These machines can be seen in operation. Must be moved fast to make room.

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1—Pond Lathe 24" swing

3—Double Platen Patch Planers

Prices on application

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PROCTOR VERMONT

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of American Machinist, published every other Thursday, at New York, N. Y. for October 1, 1945.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Gerardi, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management of American Machinist, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the name and address of the publisher, editor, managing editor, and business manager is: Publisher, McGraw-Hill Publishing Company, Inc.; Editor, Burnham Finney; Managing Editor, E. J. Tangerman; Business Manager, W. E. Kennedy; all of 330 West 42nd St., New York 18, N. Y.

2. That the owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City. Stockholders holding 1% or more of stock: James H. McGraw; James H. McGraw, Jr.; James H. McGraw, Jr., Curtis W. McGraw and Edwin S. Wilsey, Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw, all of 330 West 42nd Street, New York City; Edwin S. Wilsey and Curtis W. McGraw, Trustees for James H. McGraw, 3rd, Madison, New Jersey; Curtis W. McGraw, 330 West 42nd Street, New York City; Donald C. McGraw, 330 West 42nd Street, New York City; Mildred W. McGraw, Madison, New Jersey; Wilson C. Laucks, Spruce and Canal Sts., Reading, Pa.; Grace W. Mehren, 73 No. Country Club Dr., Phoenix, Ariz.; Margaret Stump, 1418 Rose Virginia Rd., Wyomissing Park, Reading, Pa.

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J. A. GERARDI, Secretary
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 20th day of September, 1945.

[SEAL] ELVA G. MASLIN
(My commission expires March 30, 1946.)

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7" Ajax Upsetting Forging Machine
1500# Chambersburg Forging Hammer
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15"x15"x96" NORTON; A.C., M.D.; Coolant Pump and Pan; 2 Mag. Chucks
No. 10 ILLINOIS PLAIN, 10x20" Table
No. 2 W. & M. SURF., M.D. with Mag. Chuck.
No. 2— B Reid, 6x18" table, Dust Collector, Rectifier, Magnetic Chuck.
2—12" Persons Arter Rotary Surface, P.F.
6" HEALD ROTARY SURFACE, Power feed

CYLINDRICAL

8x30" MODERN CYL., Self Cont., Coolant Pump.
No. 11 BROWN & SHARPE, 6x32", Motor Drive.
No. 22 LANDIS, 12x34", Pump & Pan, Power feed.
6x32" NORTON, Coolant pump.
11x15" PLAIN CYL., head & tailstock, Power feed.
3" LANDIS BALL RACE, No. 3½T VAN NORMAN
9x7" LEACH, coolant pump, M.D.

UNIVERSAL

12"x36" CINCINNATI UNIVERSAL CYL., M.D.
BATH UNIVERSAL, 10" swing, Power Feed

INTERNAL

No. 72 HEALD SIZEMATIC, Hydr. Feed, M.D. Ball Brg. Sp., Oil pump and pan, 15" swing
No. 70 HEALD 1¼" hole; 15" swing
No. 52 GREENFIELD HYDROILS (2), Hydr. Feed, Ball Bearing Spindle, Pump and Pan.

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No. 1½ Cinc. Univ., 5x30½" table, M.D.
Model 10-W HAMMOND DBLE. END WET CARBIDE TOOL, 11x19" tables, M.D.
No. 1 WILMARTH & MORMAN TOOL & CUTTER, b.d.; with Univ. Grind. att., 5½x42½" table
No. 1 WILMARTH & M., M.D., hd. & tailstock
STERLING UNIV., 10" swing, 22" bet. centers, 5x36" table; M.D.
#4 HAMMOND CHIP BREAKER & GRINDER, 8" stroke, drip feed tank, M.D.

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5' FOSDICK ECONOMAX, Motor on arm, A.C. M.D.
4' CARLTON, 13" col., A.C. M.D. thru gear box
4' FOSDICK, A.C. M.D. thru gear box
6' AMERICAN UNIVERSAL, Box table, M.D.
3' AMERICAN, MAXI-SPEED, motor on arm

TWO OR MORE SPINDLE

4-SPIN. MOLINE "HOLE-HOG," Adj. rail, No. 2 M.T.
4, 3 & 2 SPINDLE AVEYS, No. 2 M.T., M.D.
2-SPINDLE FOOTE BURT DRILLING & BORING

FLOOR

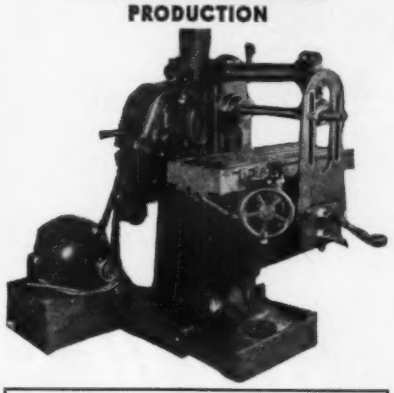
No. 262 BARNES All-Geared Camel Back, M.D.
No. 242 BARNES 25" All-Geared Camel Back, M.D.
No. 216—34" BAKER, No. 5 M.T., M.D.
25" SNYDER, No. 4 M.T., Power feed, Back Grd.
3—24" BARNES CAMEL BACK, All geared, M.D.

MULTIPLE

8-SPINDLE MULTIPLE, No. 4 M.T., M.D., 60" bet.
No. 45 PRODUCTOMATIC; 10" P.&W. SEMI-AUTO.
2—18" CINC. AUTO., 9¼x36" Table.

MILLING MACHINES

PRODUCTION



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PRACTICALLY NEW 36" ROGERS "PERFECT 36", with side head A.C., M.D.
48" ROCKFORD, 3 spin., 48" table, Hydr. feed
24" BULLARD RAPID PROD., side head, 4 Jaw
4-SPINDLE ROCKFORD, 38" table, M.D.

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8" N.B.P., Travel of bar approx. 6'7"; Length of bed 25 ft.; Hght. of column 19½ ft., M.D.
5½" NILES, Table Type, Table 23x78"; B.G.
4" KEMPSMITH, Floor Type, 42"x60" table
3⅜" BARRETT, Floor Type, No. 6 M.T., Motor Dr.
3" PUTNAM, P.F., 30½x82" Base, M.D., No. 5 M.T.
FOOTE-BURT 2-WAY DRILLING AND BORING

PLAIN

No. 4-B STANDARD BROWN & SHARPE, Dble. overam, Motor in base.
#3 CINCINNATI
No. 3-B MILW., Dble. over., Motor in base, M.D.
No. 1-B MILW., Dble. over., cpld. A.C. M.D.
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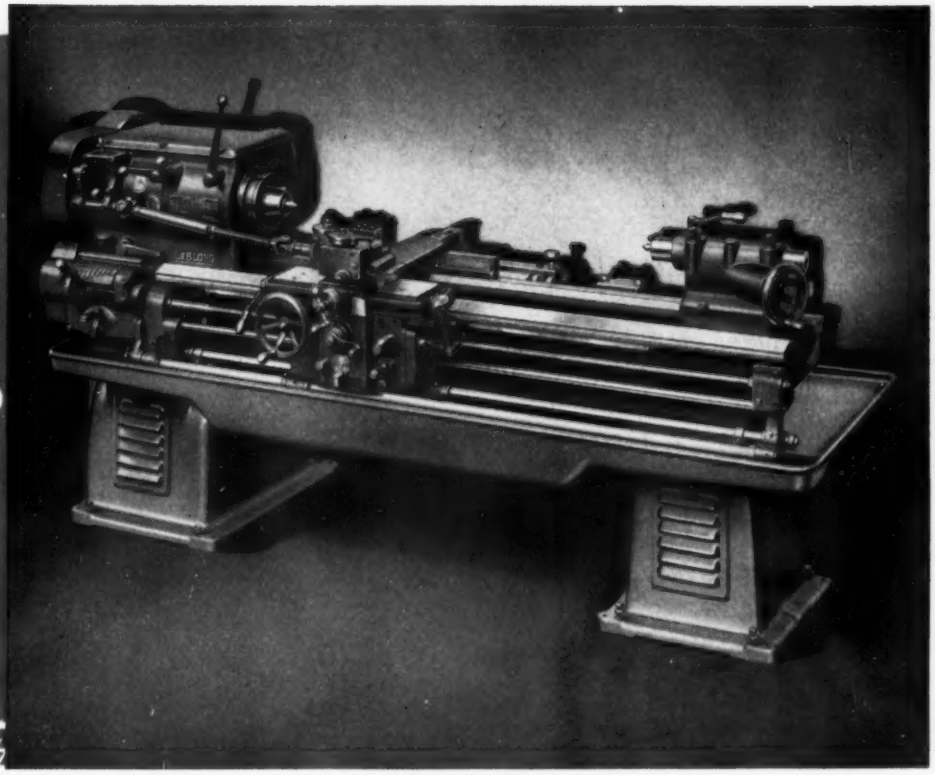

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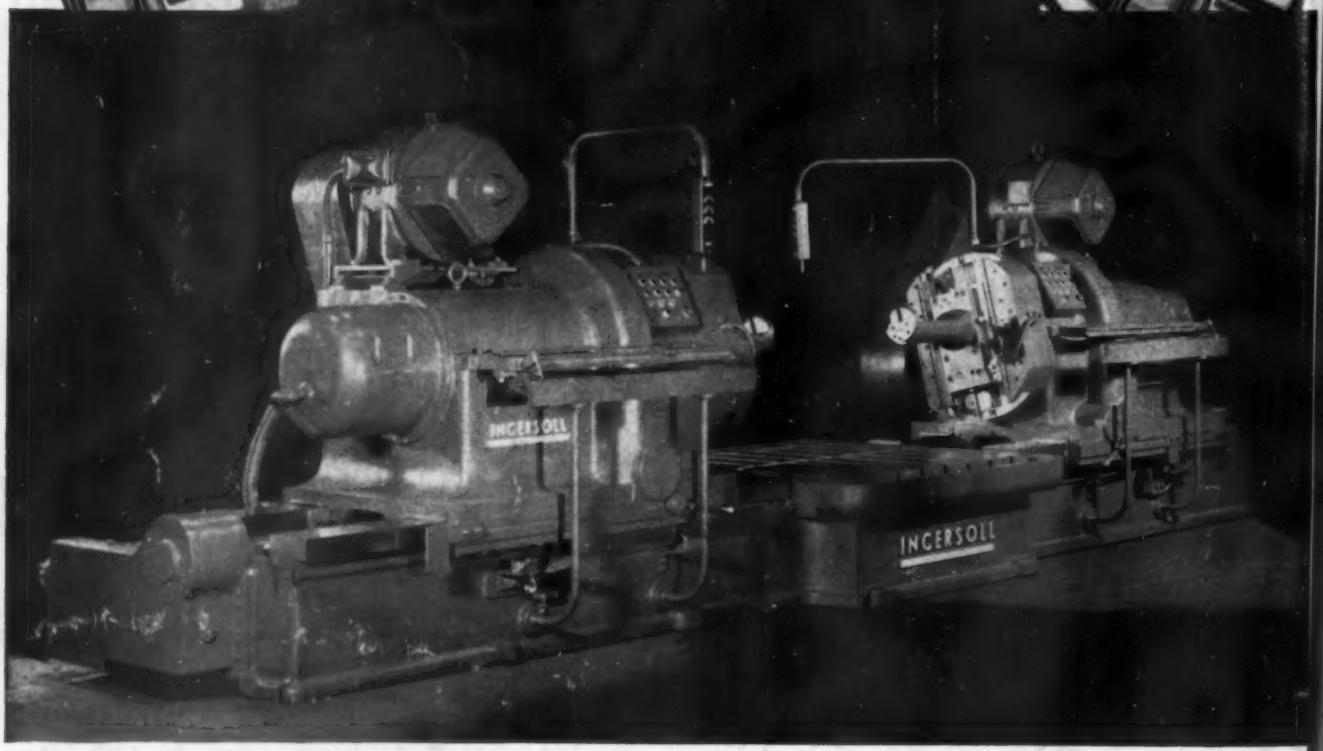
Spindle Precision Assured By



This special 2-spindle, 2-way horizontal boring machine was designed and built by The Ingersoll Milling Machine Company, Rockford, Illinois.

It is used for boring, counterboring and facing bearing recesses, end bores and counterbores in Timken Tapered Roller Bearing axle housings for railroad rolling stock.

These precision operations necessitate precision equipment, which this Ingersoll boring mill, equipped with Timken Bearings on both spindles, provides.

The Ingersoll Milling Machine Company uses Timken Bearings in many of its other machines, too. For example an Ingersoll Type "B" Milling Machine which has 4 heads—2 horizontal and 2 vertical—uses 18 Timken Bearings.

To be sure of getting Timken Bearing performance, see that the trade-mark "TIMKEN" appears on every bearing that goes in your equipment.

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS